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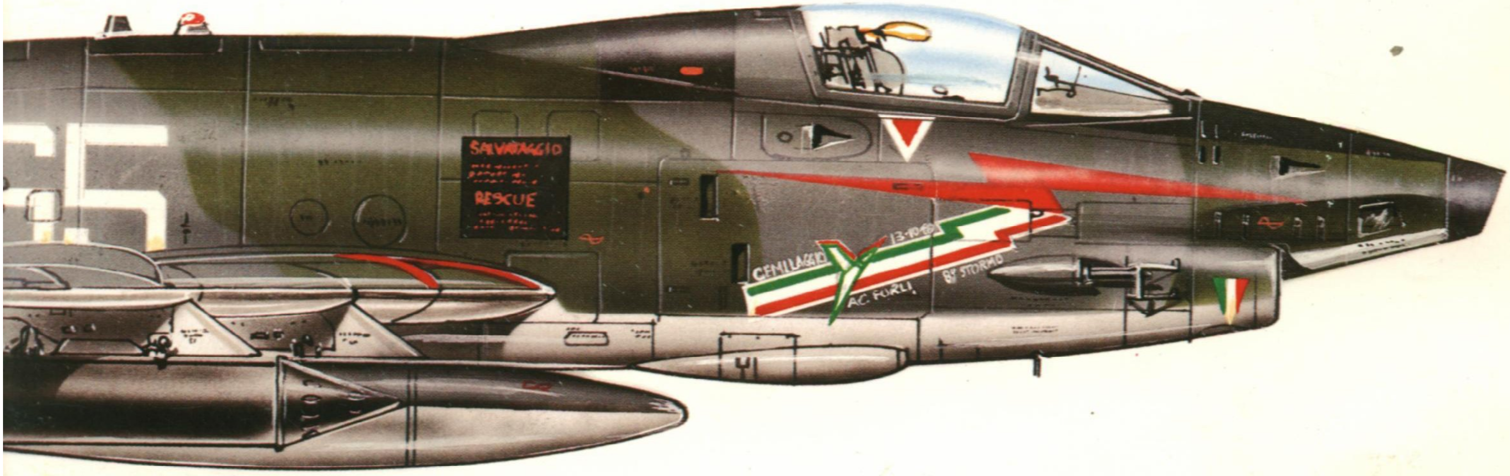

THE FIAT G.91R/T/Y

BY CHARLES STAFRACE

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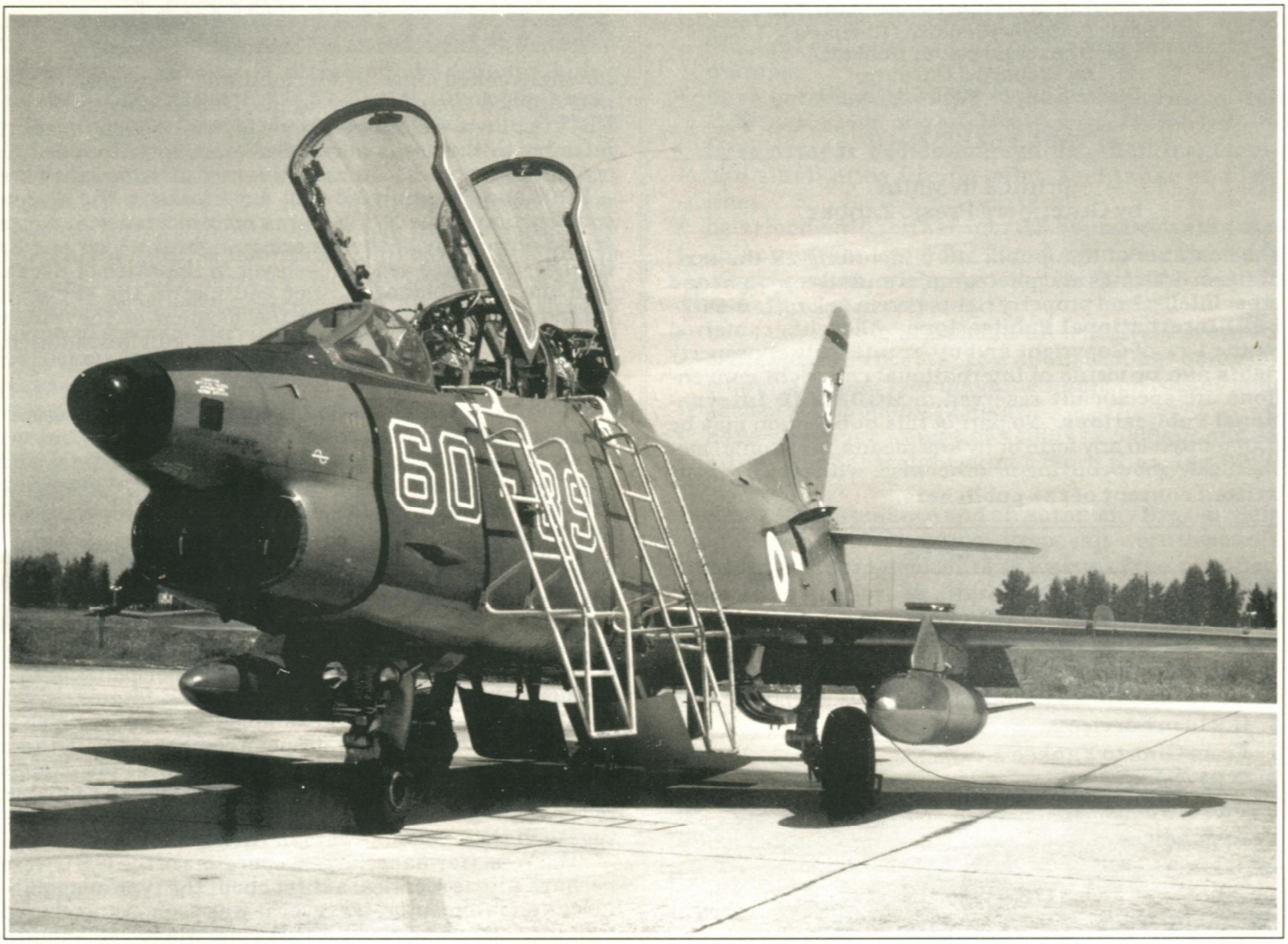

Aggressive-looking, the G.91T was the two-seat version on which fast-jet pilots of the Italian Air Force graduated. *Giuseppe Fassari*

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F-104 Starfighter
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MODELAID INTERNATIONAL Publications

CLOSE-UP CLASSICS 3

THE
FIAT G.91

By Charles Stafrace
Edited by Richard J Caruana

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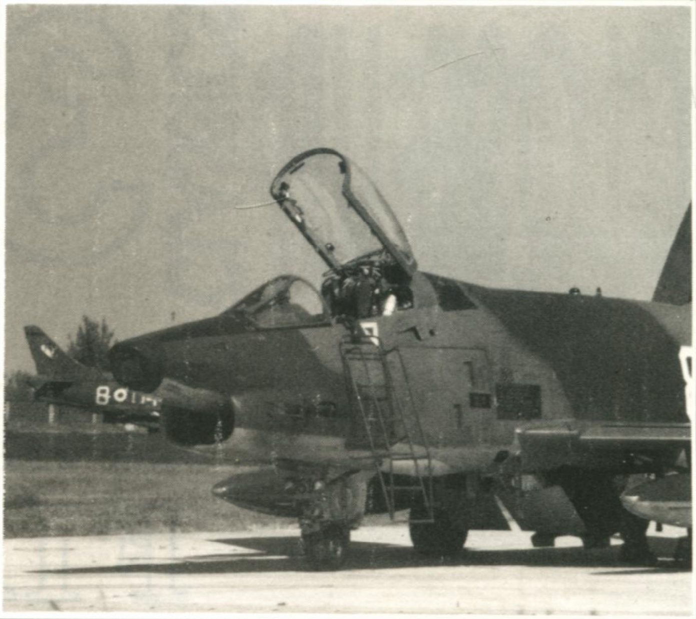


INTRODUCTION

Lovingly called *Gina* by German and Portugese pilots, and dubbed *Small Sabre* by its Italian operators, the FIAT G.91 was a classic example of how economy of effort mixed with the use of a modified existing proven design could lead to success. Its resemblance to the 'nosed' Sabre – FIAT had accumulated vast experience in the licence construction of the F-86K – was no coincidence; it *was* a scaled-down copy of the American fighter which had by then earned fame as a MiG-slayer in the skies of Korea. And the resemblance did not end just in the shape; it extended to such details as the location of the vortex generators on the rear fuselage, the gun installation, detachable rear fuselage and general construction techniques.

However, as explained in the main text of this monograph, the condensation of these similarities into a smaller, compact fighter designed around a rigid and rigorous NATO specification was in itself an engineering feat of great magnitude, and praise goes to its Turin design team at FIAT.

More importantly, the G.91 was a wholly-European fighter, and was the first attempt by NATO to adopt a standard aircraft for its member states. That this attempt did not win the success promised during the initial phase was owed to several factors, such as the availability of the low-priced Northrop F-5A and other political reasons explained elsewhere.

Still, no fewer than 767 examples were built, which is a respectable figure for a European combat aircraft, these serving with three NATO air forces. The G.91 also claims to be one of the few European aircraft (outside England) to see combat service, having been operated by the Portugese in their colonial wars in Africa.

The West Germans, largest operators of the G.91, were perhaps a little sceptical at first about the type's capabilities as an interceptor; however it was soon remembered that the G.91 was not what today one would call a multi-role fighter. It was primarily a tactical strike aircraft with a secondary interceptor role, and the two German fighter units were soon disbanded and reformed more realistically as fighter-bomber units.

The fact that the G.91 is still in service today, 34 years after the prototype's first flight, is proof enough of the sturdiness of the aircraft, an attribute which perhaps was the deciding factor in NATO's choice.

Charles Stafrace

CHAPTER ONE

NATO'S BABY

THE INCEPTION OF THE NATO LIGHT-WEIGHT STRIKE FIGHTER

The FIAT G.91 had its origins in a NATO specification, formulated in 1953, for a light-weight, low-cost strike fighter for use by NATO member airforces in support of land forces.

Back in April 1949 the North Atlantic Treaty was signed, by which the United States associated itself with its European allies in security arrangements for the common or mutual defence against possible aggressors.

As the Organisation which we know today, NATO was organised during the 9th Working Session of the Atlantic Council held in Lisbon, Portugal, in February 1952. From this Lisbon conference sprang several important issues which were to become the guidelines of future NATO policies, doctrine and activity. At the end of the conference the member states approved a document which, among other matters, demonstrated the necessity of arming the European air arms with a light-weight strike fighter capable of operating from semi-prepared areas. This reflected the lessons being learned in the Korean War which was then at its peak.

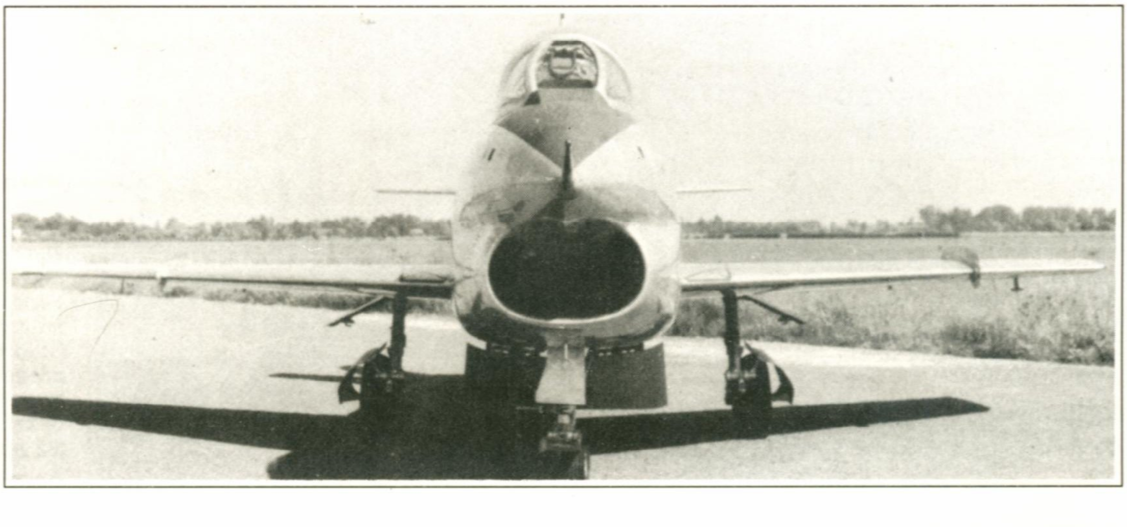
In the early fifties, the main fighter-bomber role in Western Europe (and also in Korea, for that matter) was undertaken by a vast force of F-84 Thunderjets operating with various elements of Allied Air Forces Central Europe. The F-84's range permitted it to fly from elaborate, 10,000-ft (3050m) concrete runways deep in friendly territory, but its characteristics precluded it from operating from battlefield areas close to the land forces which it was supposed to support. This necessity became one of the key concepts of NATO strategy, and it is ironic that it came so soon after the completion of a massive £700 million infrastructural project involving the extension or construction of about 150 airfields for NATO's tactical units in Europe.

During this same period the US Government inaugurated its Mutual Weapons Development Program (MWDP), intended to make use of European aeronautical design and production facilities, and to lessen the dependence of NATO's European states on US industry which could have a negative effect in time of war.

By virtue of this, and in response to the decision taken at the Lisbon conference, requirements for a Light-Weight Strike Fighter (LWSF) were formulated and transmitted to SHAPE (Supreme Headquarters Allied Powers in Europe) in Paris. These specifications were very stringent, and even the lightest-weight US aircraft of the time were unable to fulfill the NATO requirements. In effect the projected aircraft was expected to:

- be able to strike armoured vehicles, troop concentrations, airfields, POL (petrol, oil, lubricants) stores, moving targets on the battlefield and fixed installations;
- have interdiction capabilities on trains, barges and similar troop-carrying targets;
- operate from semi-prepared airfields, highways or PSP (Pierced Steel Plate) surfaces with a take-off distance to clear 50 ft (15m) not being more than 3500 ft (1100m);
- have a maximum level speed of Mach 0.95 (for at least 30% of the sortie), a radius of action of 150nm (280km) and a loiter time on target area of 8 to 10 minutes;
- have good manoeuvrability and high rate of roll (100° per second at a sea level speed of Mach 0.9)
- have armour protection against shell fragments and small arms fire for pilot, fuel tanks and fuel lines;
- be armed with, either four 12.7mm Browning machine guns, or two Aden 20mm cannon or two Aden 30mm cannon, with provision for 300, 200 and 120 rounds respectively;
- have underwing armament alternatively of twelve 3-in (7.5mm) rockets; two 500lb (230kg) bombs; 2 Napalm tanks; two machine guns; or rocket pods each of about 500lbs (230kg);
- have an empty weight of 4400lbs (2000kg) and an all-up combat weight of not more than 10,000lbs (4700kg).

Simple maintenance and an autonomy from airfield equipment was emphasised. Proposals were to be submitted within two months of the issue of the specifications while the first 30 aircraft were to be available by the first quarter of 1957. These specifications were embodied in NATO Basic Military Requirement No. 1 (NBMR-1) and on March 18, 1954 SHAPE issued these specifications to interested aircraft firms in Europe



The first G.91 prototype photographed at Torino-Caselle just after its first flight. The clean lines of the aircraft, together with its similarity to a scaled-down Sabre are very evident
Aeritalia

and called for proposals. In addition, MWDP notified all nations that the US would consider financial support to the SHAPE-endorsed project for the LWSF and $10 million were set aside for the purpose. The NATO Advisory Group for Aeronautical Research and Development (NGARD) formed an ad hoc committee to evaluate the proposals, 10 of which were submitted by three nations. These were: from Britain the Folland Gnat and a lightweight version of the Hunter; from France the Breguet 1001 and 1100 Taon, Dassault Mystere XXVI (later renamed Etendard VI) and Etendard IV, Sud-Est SE5003 Barouder and Sud-Oest Trident; from Italy the FIAT G.91 and the Aerfer Sagittario II. Of these, three were recommended as most closely fulfilling the NATO requirement – the 1001 Taon, the Etendard VI and the FIAT G.91. In June 1955 the US Government, through its MWDP, signed agreements for the development of three prototypes of each, while in a separate US-UK agreement, the British Bristol Orpheus jet engine was selected as the powerplant of the future LWSF.

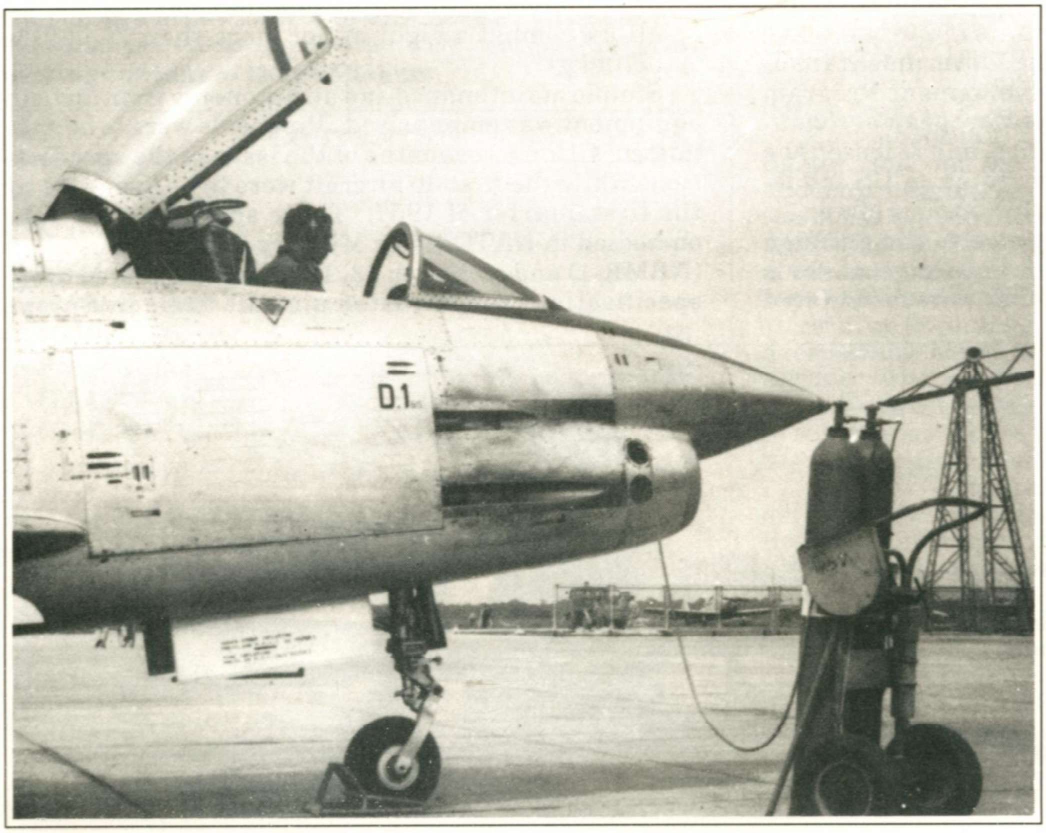
The NATO Trials

Detailed design of the FIAT G.91 continued in Turin, and the company embarked on a large-scale tooling programme as a private venture. Having reached a very advanced stage in construction, an order by NATO of 27 pre-production aircraft was placed in July 1956, although the fly-off by the three short-listed finalists had still to take place in October 1957.

First flight of the G.91 prototype, NC.1, in the hands of Riccardo Bignamini, was made on 9 August 1956 at Caselle, almost one year ahead of the Taon's. Its weight of 5800lbs (2650kgs) made it somewhat heavier than that specified by SHAPE but this did not affect its performance. It was powered by a 4050 lb/st (1837kg/s) Bristol (later Bristol Siddeley) Orpheus B.Or.01 and had a Martin-Baker Mk.4 ejection seat installed. The test flights continued regularly, Bignamini being joined by S. Marsan and V. Sanseverino. On February 20, 1957 during the 24th flight, the G.91, again with Bignamini at the controls, exceeded without difficulty the speed of sound at 29,000ft (9,000m) for four consecutive times. Seven days later, however, the Martin-Baker ejection seat came into good use when, after encountering excessive tail flutter in a high-speed run at low altitude, Bignamini was forced to abandon the aircraft and eject at about 4000 ft (1300m) above Cavour, near Turin. Although NC.1 was completely destroyed, Bignamini was saved and all the recording equipment which FIAT had wisely installed was salvaged from the crashed aircraft.

An intensive investigation was launched to solve the flutter problem, the FIAT engineers being assisted in this respect by French engineers and by the US NACA, the latter also making available its wind-tunnel facilities at Langely. The findings were incorporated into the second prototype, NC.1*bis* (MM.565) and included a tailplane of larger area and different shape, a ventral strake and a slightly raised cockpit (2.5 ins – 6cm). Powered by the 4850 lb/st (2200kg/s) B.Or.03, and carrying full gun armament, this second prototype first flew on July 26, 1957 and was still under some flight restrictions when trials to determine the final selection of the NATO LWSF were held at the Centre d'Essais en Vol, Bretigny, in France, these ending on October 4, 1957. The trials were executed by an international evaluation team of 6 test pilots and 6 engineers from four NATO countries. The test pilots were: Lt Cdr W.R. Hart, RN, seconded from 'A' Squadron of the A&AEE Boscombe Down, Britain; Capt Bigand from France; Capt M. Colagiovanni from Italy; and Maj R.B. Hippert and Capt R.F. Titus (USAF) together with Lt J.F. Lasseter (USN) from the United States.

In addition to the three Orpheus-powered prototypes ordered by the MWDP (the G.91, the Taon and



When the second prototype appeared (bearing Construction Number 1) FIAT's little fighter began to show its teeth. As can be seen in this photograph, NC.01 is now fitted with four 12.7mm machine guns. It also appears from the grime around the gun ports that these had been fired during tests. Common with its predecessor, the second prototype remained unpainted with the exception of italian national roundels in the usual six positions

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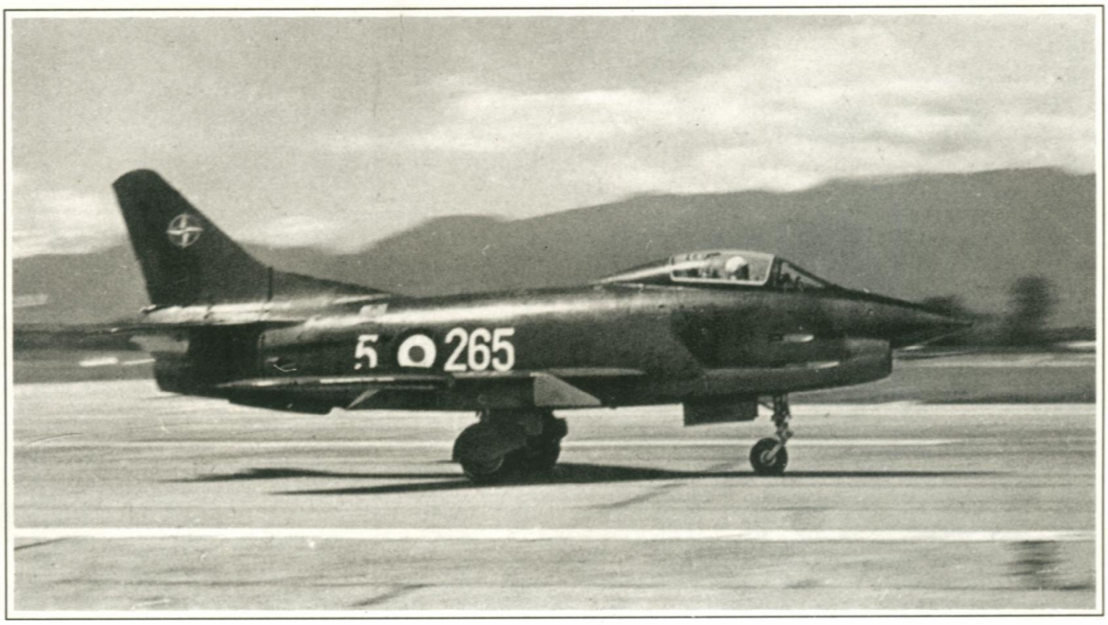
THE COMPETITORS

Breguet Br101 Taon
Preceded in the air by the similar, twin-Turbomeca Gabizo powered Br1100, the Br1001 utilised a single Bristol Orpheus B.Or.3 in response to the NATO requirement of 1954. It first flew on July 26, 1957 and, being the newest of the NATO contestants, it incorporated the latest aerodynamic design results of the time such as area-rule and included such novel structural features as honeycomb sandwiched between light alloy sheets. In this configuration it reached a speed of 650 mph (1046km/h) in a 1000 km (621 mile) closed circuit on April 25, 1958, setting a world record raising this to 667mph (1075km/h) three months later. In the trials at Bretigny the Breguet Taon displayed a remarkable short-field performance with a tail-chute and this was expected to be improved with the projected larger wing of the development models. In spite of its more modern technology and good development potential, the Taon lost to the FIAT G.91; some sources sustain that the NATO choice reflected the Italian fighter's better production schedules. Apart from two prototypes, no other production was undertaken.

Dassault Etendard VI
Formerly known as the Mystere XXVI, the single-Orpheus-powered Etendard VI was developed by Dassault in parallel with the similar twin-Gabizo-powered Etendard II and single-Atar 101E-powered Etendard IV. While the Etendard II was abandoned, and the IV was to be further developed into the *Aeronavale* aircraft still in service today, the Etendard VI was specifically built for the NATO requirement, thus its Orpheus B.Or.3 turbojet. Dispensing with a pressure cabin owing to its projected low-level operation, Etendard VI was equipped with a Mk.4 Martin-Baker ejector seat in an air-conditioned cockpit which boasted excellent forward view. Installation of the Orpheus could be performed without jacking the aircraft, and the ground trolley used for slinging the engine also contained the armament pack and the under-wing fuel tanks. Low-pressure tyres facilitated rough-field performance, the undercarriage retracting into the fuselage. The Etendard VI first flew on March 15, 1957. The prototype, in fact the only one built, took part in the NATO Bretigny trials which were won by the FIAT G.91. The French were bitterly disappointed with the result and never adopted the G.91 in their services.

the Etendard VI), the team also evaluated two other French designs the Sud-Est Baroudeur and the Dassault Etendard IV, both powered by the SNECMA Atar turbojets and both included in the trials at the strong insistence of the French. The purpose of the trials was to "determine the capabilities of the various aircraft and their ability to complete the designed mission." The aircraft each made three flights per day, with each of the six pilots flying in turn all five aircraft. The three-week tests were exhaustive and concerned the following: taxiing characteristics on runway and semi-prepared strips; slow-speed handling and stalls; static and dynamic longitudinal, lateral and directional stability; take-off, landing and overshoot qualities; stability in manoeuvring flight; longitudinal trim changes with power, etc; effectiveness of controls and trim; high Mach number effects; evaluation of mechanical or electronic devices affecting flying qualities; rate of roll; measurement of static thrust; aircraft tare weight; airspeed and altimeter position errors; take-off and landing distances; climb performance; level flight performance; mission profile tests; turn-round times (refuelling and re-arming); cockpit layout; ground handling; ease of maintenance; and ground firing of machine guns.

The trials confirmed the G.91 as being superior to its competitors, but it was not until January 1958 that this decision was officially announced. The French were bitterly dismayed at this decision and felt themselves as the only losers; the Italians had won with the airframe, while the British had secured important production of their Bristol Orpheus and Martin-Baker ejection seat.



One of the pre-production aircraft in NATO camouflage and bearing the markings of5ª *Aerobrigata* of the *Aeronautica Militare Italiana*. Due to the fact that these aircraft were still being tested under operational conditions under the auspices of NATO, they carried on the fin the organisation's emblem *Aeritalia*

CHAPTER TWO

THE FIAT G.91 STRUCTURE

A SIMPLE, ROBUST AIRCRAFT

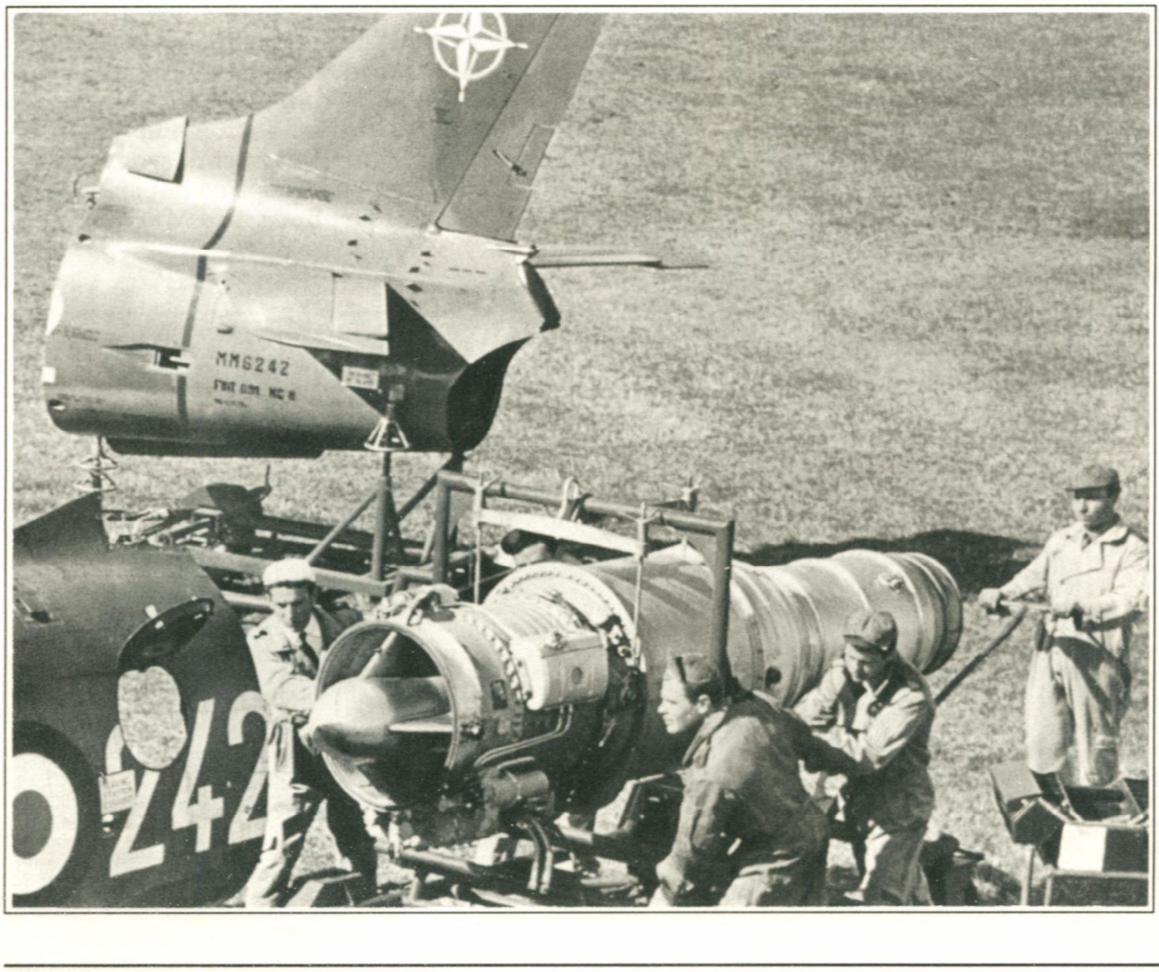
A major factor which had won for the G.91 the NATO contract was its superior capability of operating from grass or semi-prepared fields with the minimum of dependence on permanent ground installations. This had necessitated a robust structure which could absorb the rigours demanded by such operations.

Both structurally and aerodynamically, the FIAT G.91 closely resembled a scaled-down version of the North American F-86K Sabre. FIAT had built 231 examples of the American fighter under licence and, given the short time available for submitting preliminary designs to the NATO LWSF contest, FIAT were wise in adhering to an already proven construction technique and aerodynamic design which saved time because of predictable flying characteristics. This scale-down in such detail was, nonetheless, and engineering feat of considerable magnitude, particularly given the stringent requirements of weight and performance demanded by NATO.

Construction was relatively simple. The wings were built on 2 main spars with an inboard structure integral with the under-fuselage; this latter part permitted attachment of the main undercarriage and the slotted flaps. A thickness/chord ratio of 9% was selected, with a sweep-back of 37°. The rather thick wing was preferred in order to give a more robust and durable structure in view of the operational use of the aircraft. No fuel was carried in the wings, except for fuel lines reaching the underwing pylons. The ailerons were activated by Jacottet hydraulic servo-controls, and were particularly efficacious, permitting the aircraft a roll rate of 250° per second at cruising speed. The tail surfaces also had a sweep-back of 37°, the tailplane being of the variable incidence type, electrically-controlled.

The fuselage was of the conventional shell type and divided in three parts. The forward section, which was built separately and then rivetted to the central section, contained the gun-bays, nose-wheel bay, UHF radio equipment, radar, radio-compass, IFF and other equipment as well as the cockpit, which was fairly roomy for an aircraft of the G.91's size. To make it more comfortable for the pilot, the cockpit was pressurised and airconditioned. It was enclosed on three sides by armour plating while the wind-screen was bulletproof. The nose-cone, containing three Vinten 70mm cameras (forward, vertical and oblique looking), hinged forward for easy access to the equipment.

The central portion of the fuselage was occupied almost entirely by the seven fuel tanks with a total capacity of 375 Imp gallons (1600l), protected against ground fire by armour-plating, this protection also extending to the armour-clad airbrakes. The bottom central fuselage contained also the main undercarriage bays, which were fairly deep considering the use of fat, low-pressure tyres for grass field operation. The undercarriage was designed by the well-known French



Probably the most important feature of the G.91's structure was its ease of servicing in the field. The photograph shows the eighth pre-production aircraft (MM6242) having an engine changed on a grass field. The little FIAT fighter was unique in this at the time, and NATO's choice must have been highly influenced by this fact
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The two top views at right show the FIAT G.91 production line and the final assembly line at Turin, where aircraft destined for the AMI were built
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The two photographs at bottom right show an early G.91R being serviced on a grass strip. The facility with which such operations could be carried out is indeed surprising
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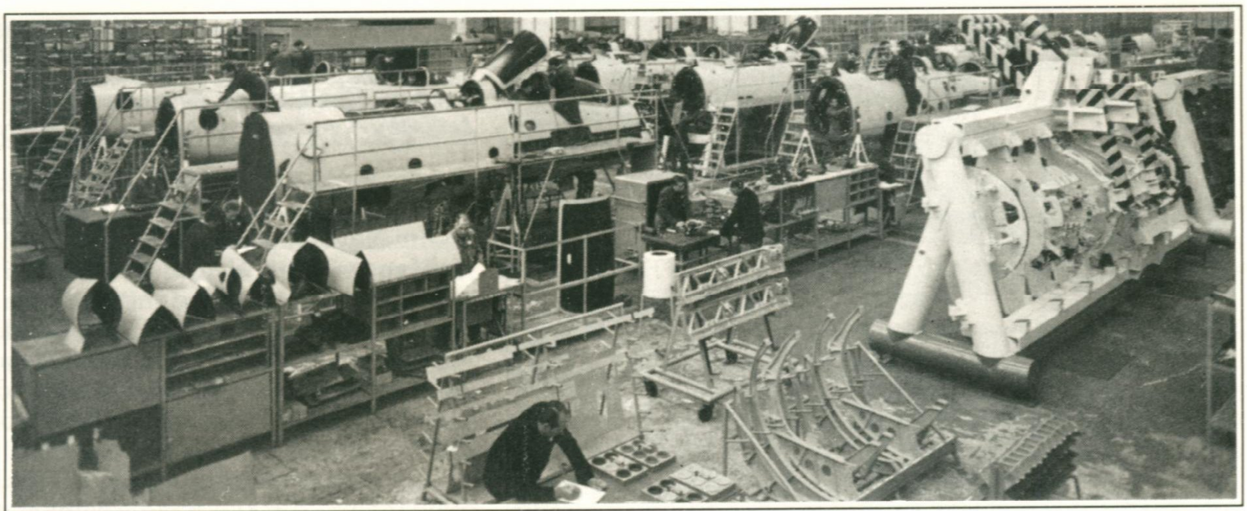
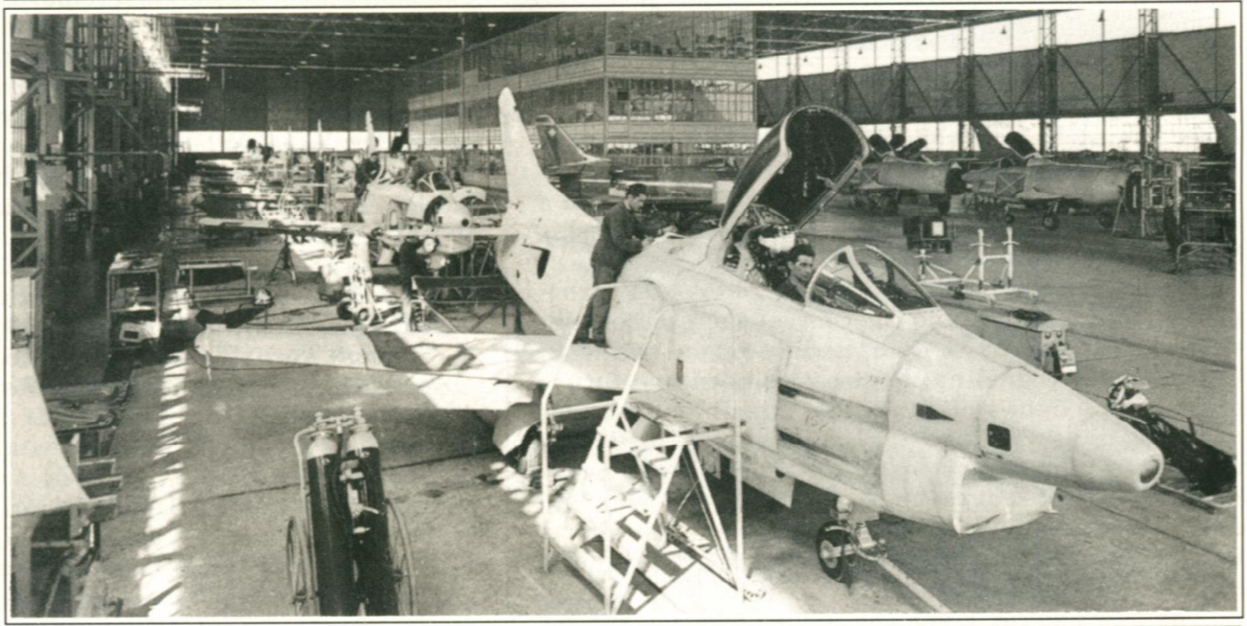




firm Messier.

The third rear section of the fuselage was completely detachable, with a 4-bolt pick-up for easy access to the Orpheus engine. This part of the fuselage also contained, of course, the tail unit as well as the brake-chute housing.

In the air, the G.91 was simple to fly and had excellent manoeuvrability. With 100% power, accelleration on take-off was rapid, the nose-wheel could be raised at 90-95 knots, and actual take-off made at 125 knots with external load, and at 120 knots clean, clearing a 50-ft (15m) obstacle at 3600ft (1100m). Initial climb rate was 600ft/m (1830m/m) and, aircraft clean, it could reach 29,000 ft (9000m) in three and a half minutes. The G.91 had a maximum sea level speed of Mach 0.88 (688mph-1068km/h), Mach 0.9 (675mph-1080km/h) at 5000ft (1520m), Mach 0.91 (637mph-1019km/h) at 20,000ft (6100m), normal cruising speed being 253mph (405km/h) at 35,000ft (10700m). Landing speed was 138mph (220km/h) and landing run on tarmac around 1980ft (600m) with the aid of brake-chute. Combat radius was 200 miles (320km) including a 10-minute loiter on target, while ferry range was 1150 miles (1840km). Ceiling was 42,980ft (13100m). These figures relate to the various sub-variants of the G.91R, those of the G.91T (described later) being slightly different.

The Fiat static test laboratory where all components, engine and engine systems, avionics, etc were thoroughly tested in simulated flight conditions before being fitted to production aircraft. The airframe is believed to be from a converted pre-series aircraft
Aeritalia

The Bristol Siddeley Orpheus

After having become renowned for its reliable radial engines such as the Mercury, Hercules and Centaurus, the Bristol Aeroplane Co. decided in 1955 to form a separate subsidiary for its aero-engines division, this becoming known as Bristol Aero-Engines Ltd.*

Work had long been started at Bristol's on turboprop and jet engines, and the company's first pure-jet engine, the Olympus, is still in service today in Concorde. Recognising the possible need and future demand for a light-weight engine of medium thrust for powering military aircraft, Bristol's started in 1954 to develop such an engine designated BE.26 as a private venture. Combat experience in the Korean War had indicated that a 50-hour life would be adequate for a military engine, but Bristol's decided to design theirs to a full 150-hour life-span.

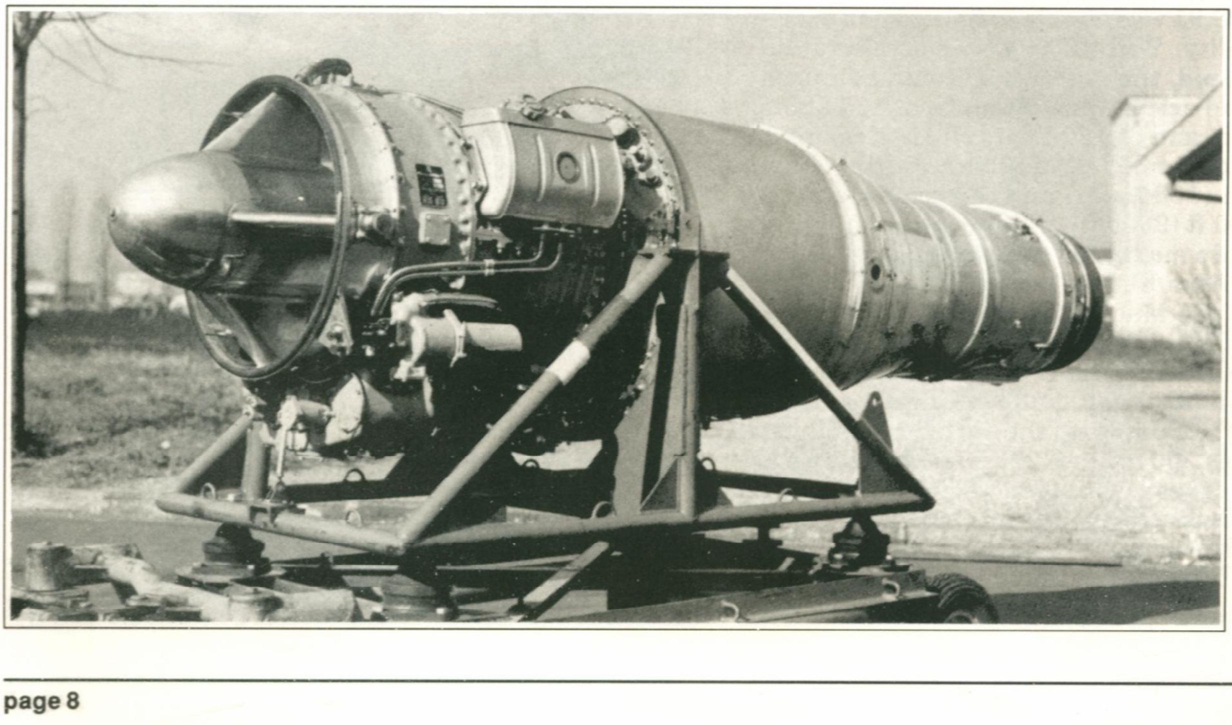
The new engine, given the name *Orpheus,* ran for the first time on December 17, 1954 and by May 1955 had completed its 150-hour bench test, power output then being 3285 lb/st (1490 kg/s) with a 1:4.1 thrust/weight ratio. At about the same time, Folland had been designing their Gnat fighter practically around the Bristol engine, and in fact the Orpheus B.Or.1 took to the air for the first time in the Gnat on July 18, 1955. The B.Or.2 with a 4520 lb/st (2050 kg/s) passed its type test in November 1956.

Meanwhile, NATO, recognising the engine's potential, had specified the Orpheus as the powerplant for its future Light-Weight Strike Fighter under Mutual Weapons Development Project and the B.Or.3 version powered the three short-listed contesting aircraft: the Dassault Etendard VI (Mystere XXXI), the Breguet 1001 Taon and the FIAT G.91. The B.Or.3, with a weight of only 835 lb (379 kg) and a thrust of 5000 lb/st (2268 kg/s) had a remarkable thrust/weight ratio of 6:1.

This NATO success, together with orders for the engine coming in for the Folland Gnat and the Japanese Fuji T1A, guaranteed continued production of the Orpheus which at the time became the most advanced medium-thrust lightweight jet engine in the world. It was eventually also produced under licence in Italy, West Germany and India.

LEADING SPECIFICATIONS:
ORPHEUS B.OR.3 (MARK 803)

Take-off Thrust:	500 lb/st (2268 kg/s)
Weight:	8351 lb (379 kg)
Thrust/weight ratio:	6:1
Specific fuel consumption:	1.08lb/lb thrust (1.08kg/kg)
Length:	75.47in (1917mm) intake flange to exhaust flange
Diameter:	32.4in (823mm)
Frontal area:	824 sq in (0.53m²)



The FIAT G.91's powerplant, the compact but highly powerful Bristol Siddeley *Orpheus* 80302
Aeritalia

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* On April 1, 1959, Bristol Aero-Engines Ltd and Armstrong Siddeley Motors Ltd merged to form Bristol Siddeley Engines Ltd.

CHAPTER THREE

G.91s FOR SALE

SELLING THE NEW FIGHTER AND DEVELOPING A TWO-SEATER

Following the flight of the second prototype, NC.1*bis* (MM.565) on July 26, 1957, a third prototype, MM. 566 was completed soon after, followed by the first pre-production aircraft (MM.6238). In fact, it was the last-mentioned two machines that took part in the NATO trials at Bretigny in September/October 1957.

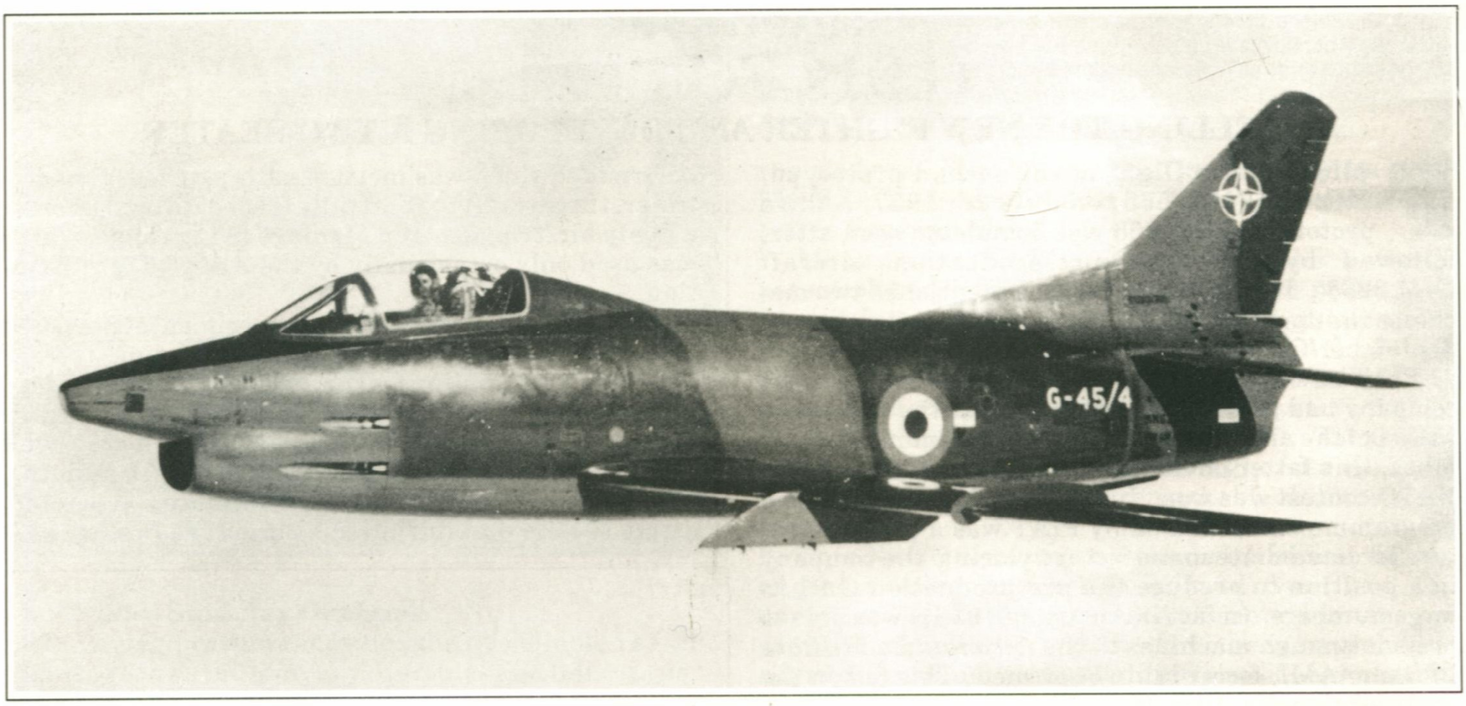
FIAT having gambled all its stakes on the G.91, the company had given more importance to the industrial aspect of the aircraft rather than to its commercial viability, this latter obviously being secured in case the NATO contest was won. In fact the large-scale tooling programme embarked on by FIAT was a private venture for immediate manufacture placing the company in a position to produce the pre-production G.91 in large numbers. In fact in August of 1958 it was able to provide enough machines to the *Aeronautica Militare Italiana* (AMI) for a unit to be formed. This fell on the 5ª *Aerobrigata*'s 103° *Gruppo CTL* (*Caccia Tattici Leggeri* – Light Tactical Fighter) based at the *Reparto Sperimentale Volo* (SPA – Experimental Flight Test Centre) at Pratica di Mare, near Rome. The aircraft were operated from outlying fields, with unprepared surfaces, by their Italian pilots who were soon joined by *Luftwaffe* officers, the German service having expressed interest in the aircraft's capabilities. After a 2000-hour programme, the 103° *Gruppo* transferred to Frosinone, where a 4500-foot (1400m) grass surface was available, with Furbara firing range situated nearby.

In late June/early July 1959 the 103° transferred again, this time to the Region of Friuli, in Northern Italy, where the unit operated for the benefit of an international commission led by General Johannes Steinhoff of the *Luftwaffe*, later to become Chief of Staff of that service. The G.91 truly made an exhibition of its capabilities. Operating from the grass surface of Campoformido, which was mottled with patches of muddy water, the aircraft took off fully loaded, to land later on a dusty airstrip near the Maniago firing range, which was used only occasionally by the Army's Light Aviation.

The G.91s also operated for experimental purposes from the Udine-Trieste highway, effecting several take-offs and landings. Ten machines made no less than 140 sorties in 4 days, at 100% serviceability thanks also to the highly efficient ground crew who managed to turn-round an aircraft in only 10 minutes, and to change an engine in only 46 minutes. It is interesting to note that during this period the first tactical

Above: Early operational experience with the G.91 was highly positive with 100% efficiency being recorded in four days and over 140 sorites. ***Aeritalia***

The high efficiency rate of the G.91 impressed the *Luftwaffe*. This air arm was to be the only one to acquire the type in considerable quantities apart from the Italian Air force. Germany also saw in the dimunitive FIAT an ideal subject to revive its domestic aircraft industry ***Via Charles Stafrace***



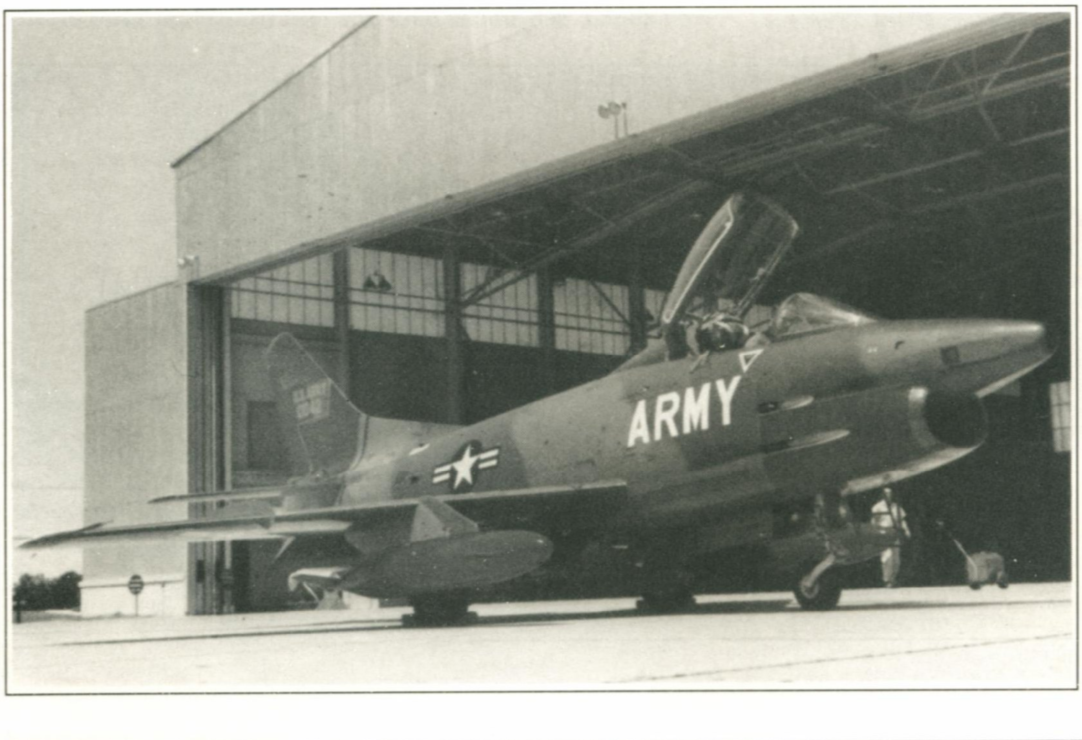
reconnaissance version, the G.91R, made its appearance. Its development had been expressly requested by NATO's AGARD, which also ordered four pre-production models (MM.6251, 6253, 6257, 6259) and later recommended production in series. In the meantime, the AMI placed an order for 50 aircraft of the G.91R/1 variant.

The Friuli trials by the 103° *Gruppo* must have made a good impression also on the *Luftwaffe* representatives. Soon an order for 50 G.91R/3s was placed, followed by a massive order for 294 machines to be produced under licence by a West German consortium, Flugzeug-Union Sud, headed by Dornier but also including Messerschmitt, Heinkel and other sub-contractors.

France ordered 50 G.91R/2s while serious interest for the purchase of 25 R/4 aircraft each was shown by Greece and Turkey, under off-shore procurement basis. The Austrian Government placed orders for 12 R/3s and two trainers (development of the two-seater having already been initiated by FIAT), interest being shown also by other non-NATO countries – Argentina and Switzerland in particular.

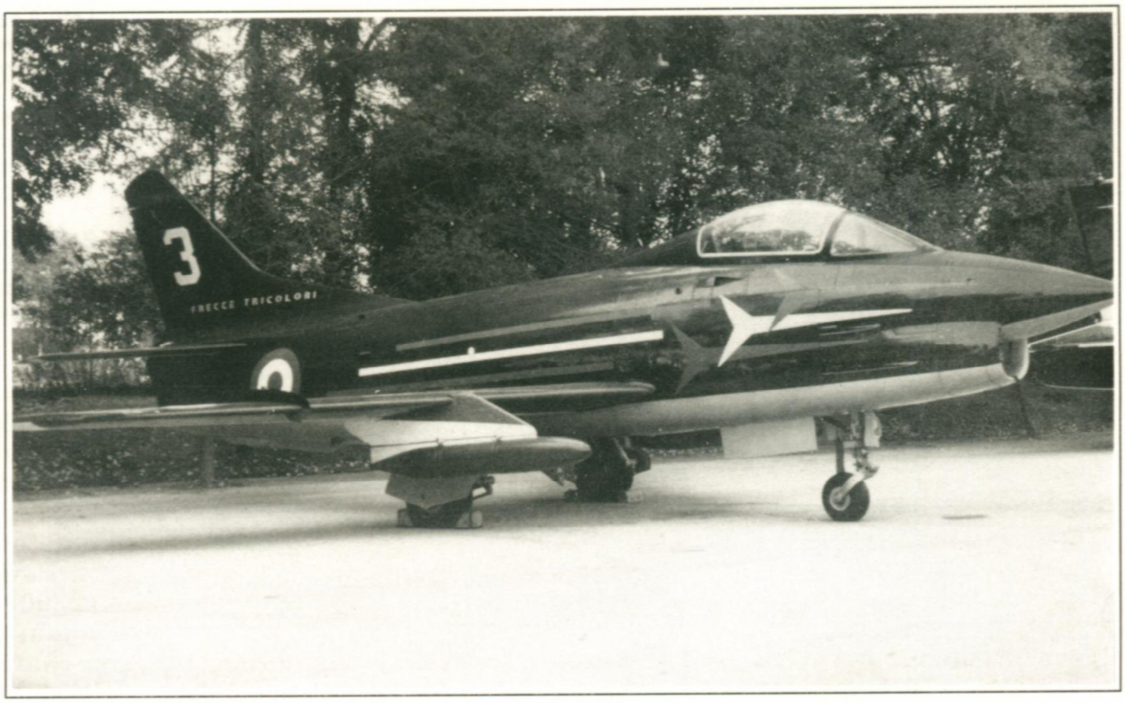
The R/3 version required by the *Luftwaffe* differed from the similar R/1 then entering service with the AMI in having 4 wing pylons, a pair of DEFA 30mm cannon instead of the four 12.7mm machine guns, and more sophisticated avionics. The R/4 for the Greeks and Turks carried also 4 wing pylons but had the armament of the R/1, while an R/5 possessing longer range was studied for the Royal Norwegian Air Force. (For information on the variants and sub variants see Appendix 2).

Meanwhile, while the R/1 version flowed off the Caselle production lines and replaced the pre-production machines in AMI service, the earlier airframes went to re-equip, on March 1 1964, the 313° *Gruppo Addestramento Acrobatico*, better known as the *Frecce Tricolori* aerobatic team. It was the first time after the Second World War that Italy's national aerobatic team mounted an indigenous aircraft. For this purpose, the pre-production aircraft underwent a thorough modi-



Above: G.91R/1 used by Bristol-Siddeley for trials of the Orpheus and carrying temporary British registration G-45/4. The national markings remained Italian – also showing on the fin is the NATO badge *Bristol-Siddeley*

Left: One of the G.91R/1s that managed to cross the Atlantic. The US Army received a small number of G.91s (including a two-seater) for evaluation at Fort Rucker, in Alabama.



Right: A real star of so many airshows, the G.91 PAN (*Pattuglia Acrobatica Italiana*) of the *Frecce Tricolori*. The all-blue Fiats became known around the world for their daring displays. This particular example is preserved at Rivolto airbase (Udine) and was photographed in September 1986.
Giuseppe Fassari

Bottom: A G.91R/3 of LeKG 43, *Luftwaffe*, carrying the original style of coding used during 1967.
Via Richard J Caruana

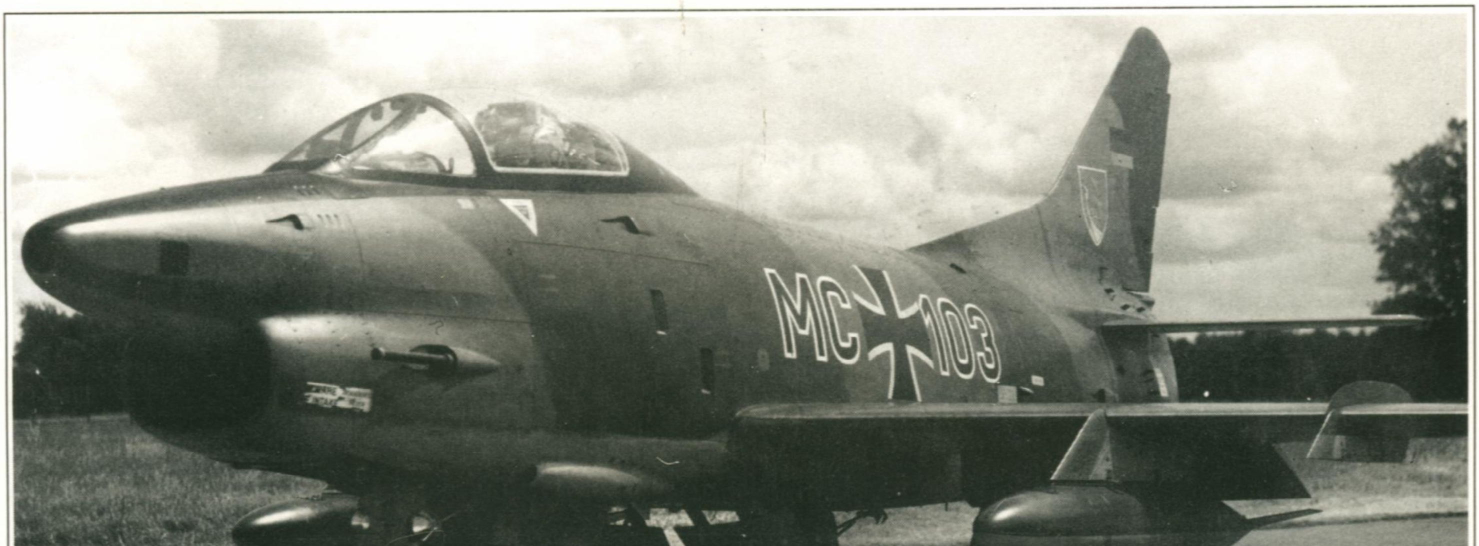
fication programme at FIAT's Caselle works, resulting in a virtually different version, the G.91 PAN (*Pattuglia Acrobatica Nazionale* – National Aerobatic Team). Although painted in the familiar gaudy scheme of blue, red, white and green, the G.91PAN was a fully operational aircraft, and could carry arms in case of emergency.

With an order list reaching the 500 mark, the future of FIAT's little fighter looked indeed very promising, as did NATO's concept of a standard aircraft for its member states.

However, this was not to be, unfortunately. While the *Luftwaffe* order was very substantial, and the AMI went on to place further orders, international politics and jealousies intervened, and interest suddenly started to wane. The French were the first to cancel their order. Although two R/4s were built carrying the R. Hellenic Air Force insignia and serialled 10098/NC.98 and 10109/NC.109, the latter even being officially 'presented' to the Greeks, the order was cancelled. The Greeks had been lured by the provision of the Northrop F-5A under the Mutual Air Programme launched by the US.

The Austrian Air Force cancelled its order too, following deteriorating diplomatic relations between Italy and Austria over the Tirolese border question. The Austrians eventually received 30 reconditioned J29Fs from SAAB. The Turks followed their Greek neighbour's example and withdrew their order and, while the R/5 for Norway remained only a project, no further interest was evinced by Switzerland and Argentina. Although a sales tour to Iran was undertaken in October 1959, two G.91s performing at Doshah-Tappeh in the presence of the Shah Reza Pahlevi, the matter stopped there.

Further afield, even the US Army had initially demonstrated interest in the G.91. In early 1960 four machines were sent aboard USAF C-124 transport aircraft to the USA for evaluation as a close support aircraft. The two AMI R/1s and two *Luftwaffe* R/3s were put at the disposal of a US Army technical team at Fort



Left: A pair of G.91R/1Bs of the 103° *Gruppo* (2° *Stormo CBR*) based at Treviso-Sant'Angelo, line up on 06 runway at Luqa, Malta for take-off. The R/1B was a strengthened version of the R/1. Only fifty examples of this type were built for the *Aeronautica Militare Italiana.*
Via Richard J Caruana

Rucker, Alabama, and at Kirtland AFB in New Mexico. A G.91T was also loaned to the US Army for the training of its pilots. The concept of a close-support unit was, however, passed over to the US Air Force which did not consider the G.91 suitable to its requirements. An unhappy JATO-take-off accident in February 1961 during the trials at Fort Rucker caused the death of Riccardo Bignamini, who had made the first flight of the G.91 prototype four years earlier.

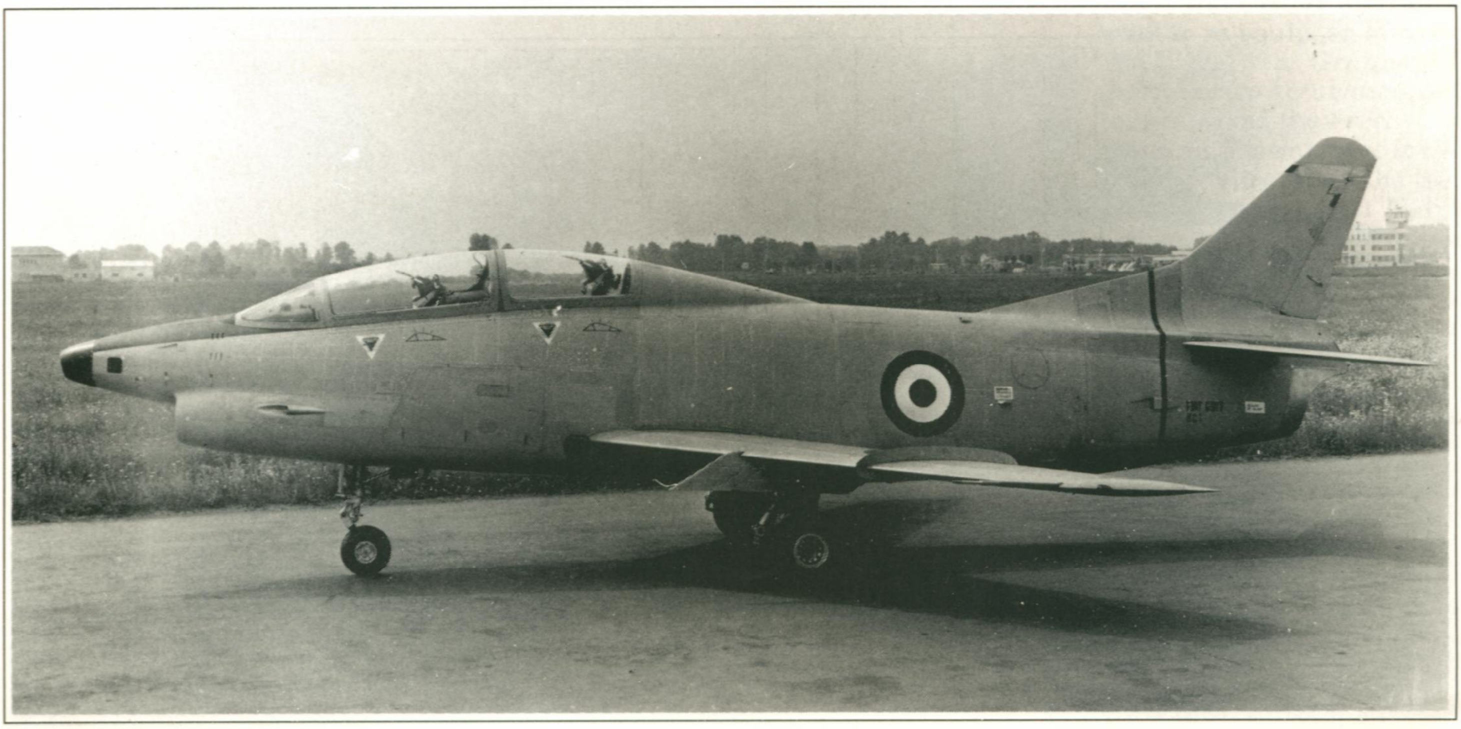
Two G.91s (pre-production MM.6246 and R/1 MM.6285) carried British 'G' registrations (G-45/4 and G-45/5) between 1959 and 1961. These airframes were put at the disposal of Bristol Siddeley in Britain for trials of the Orpheus B.Or.803.

Development of the G.91T

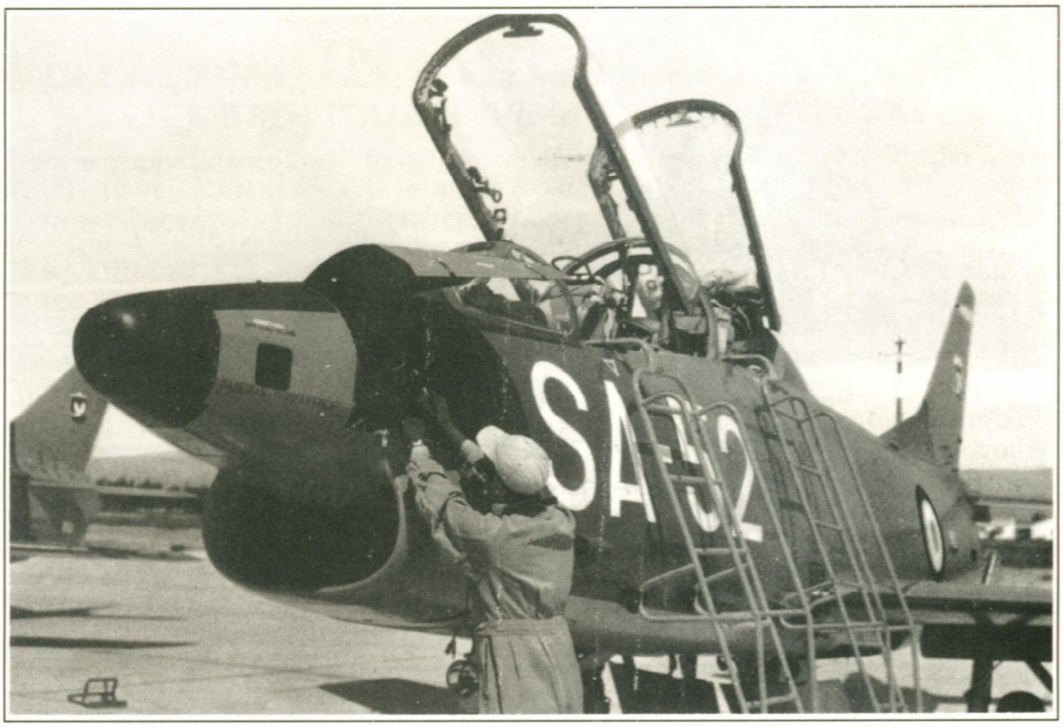
Even before the first prototype of the single-seat G.91 had flown, the AGARD had recommended the development of a two-seat version for use as an advanced trainer, and finance was procured for the construction of two pre-production aircraft, MM.6288 and 6289. Development time was rather long, and it was not before May 21, 1960 that the G.91T, as the version had been designated, made its first flight.

Powered by a 4850lb/st (2200kg/s) Bristol Siddeley Orpheus B.Or.801-02, the G.91T maintained the same characteristics of the single-seat version, including the ability to operate from semi-prepared and grass surfaces, also retaining full fighting capabilities. In fact little modification was necessary, except for the lengthening of the forward fuselage by 4ft 6 ins (1.41m), enabling the addition of a second cockpit in tandem. The trainee, who sat in front, had an excellent forward view, as had the instructor, thanks to his slightly raised cockpit. Fixed armament was two 12.7mm machine-guns which were not, however, interchangeable with cannon.

The first examples off the FIAT production line, the G.91T/3, went to the *Luftwaffe* which had shown interest at a very early stage in the G.91T's potential, and had ordered 44. A further 22 were later to be produced by Flugzeug-Union Sud for the *Luftwaffe*, these being recognisable by the instructor's slightly 'bubbled' canopy necessitated by the installation of a different type of ejection seat. The German production line closed in October 1972, and among the units receiving the T.3



Bottom: Fiat G.91T, NC.1, first prototype of the two-seater version later to acquire the serial MM.6288.
Via Charles Stafrace



Right: Ease of maintenance again won the day for the G.91T. As can be seen, the camera bay and equipment can be reached from the ground. The same applied to most other service points around the fuselage, including the gun bay of all versions
Aeronautica Militare Italiana

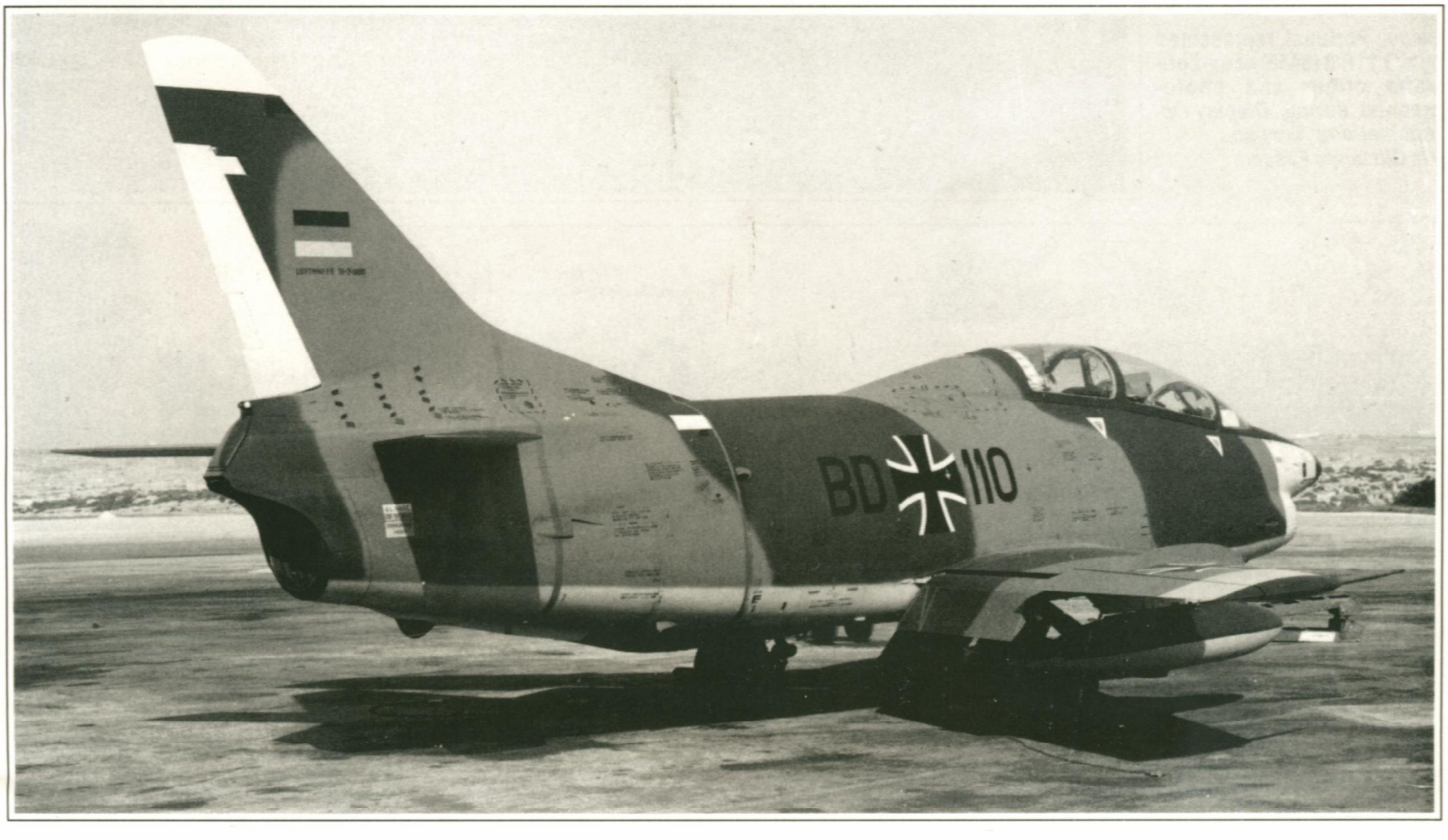
Below: Fiat G.91T/3, 91-2-0010, coded BD+110 of *Waffenschule* 50 photographed at Luqa, Malta on July 20, 1966
Via Richard J Caruana

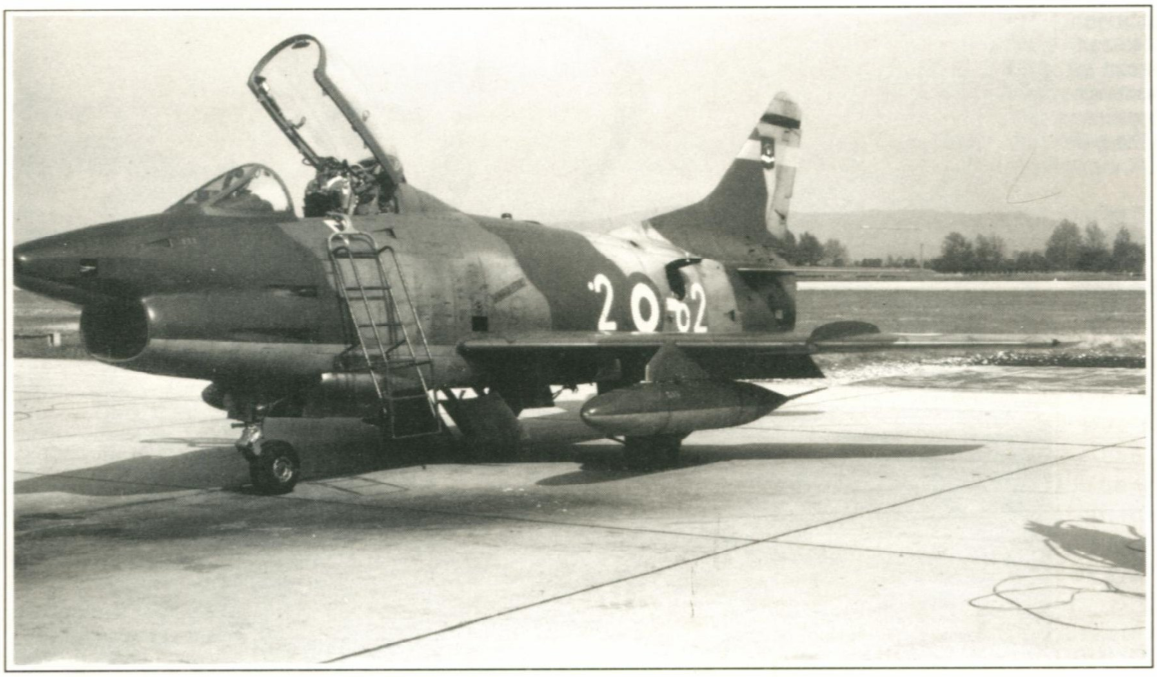
were *Waffenschule* 50 at Erding, which received 32, and *Erprobungsstelle* 61 at Manching which received two.

Italian production delivered 76 G.91T/1s to the AMI, the last example leaving the line in 1974. The G.91T/1 Srs 2 had the 'bubble' instructor's canopy of the German T/3, this modification being effected retrospectively to all previous T/1s, R/1s and German R/3s

The majority of the AMI's T/1s went to the SVBAA (*Scuola Volo Basico Avanzato Aviogetti* – Advanced Basic Jet Flying School) at Amendola. It received its first examples in December 1964 after relinquishing the FIAT G.82, which served for only a short period, and the Lockheed T-33. The school is still flying the old faithful G.91T/1 from Amendola at the time of writing, though in 1986 it was redesignated 60ª *Brigata Areea* (201° and 204° *Gruppi*) and hence carry the codes in the '60' series rather than the previous 'SA' series. The 60ª BA is scheduled to receive the trainer version of the AMX in 1994. A few examples of the G.91T also went to the *Reparto Sperimentale Volo* at Pratica di Mare, these being coded 'RS'.

The *Luftwaffe* transferred eleven G.91T/3s to Portugal between 1976 and 1982, and these were distributed between the two operational G.91 squadrons of the *Fôrça Aérea Portuguesa*, *Esquadra* 301 and 303, serials being 1801-1811.

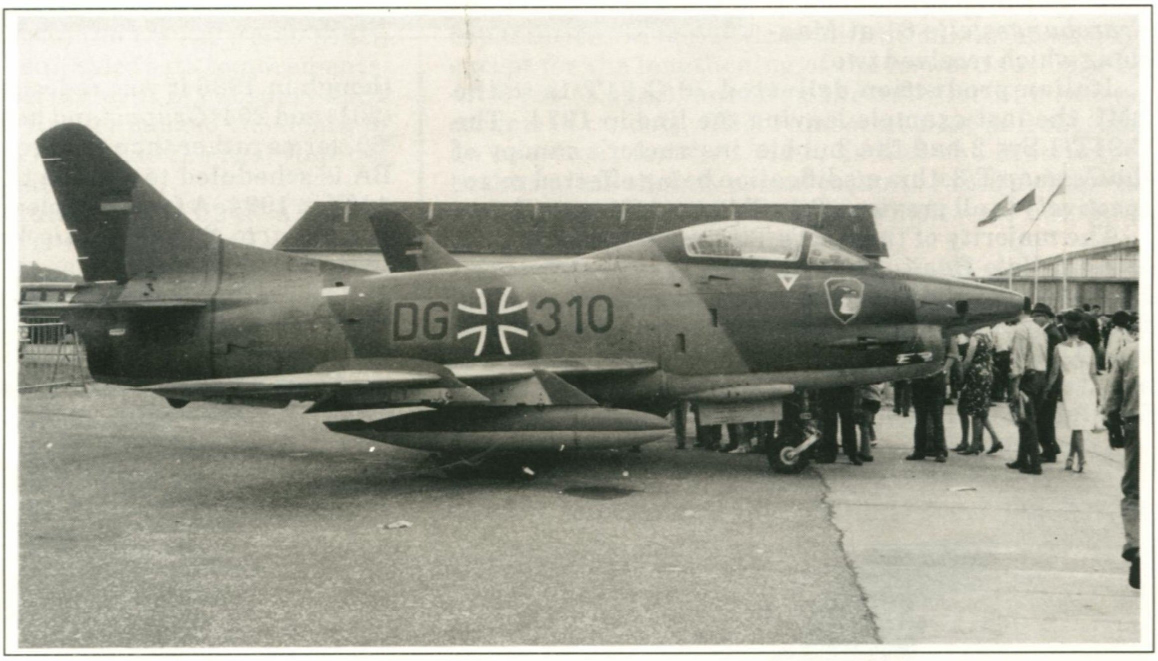


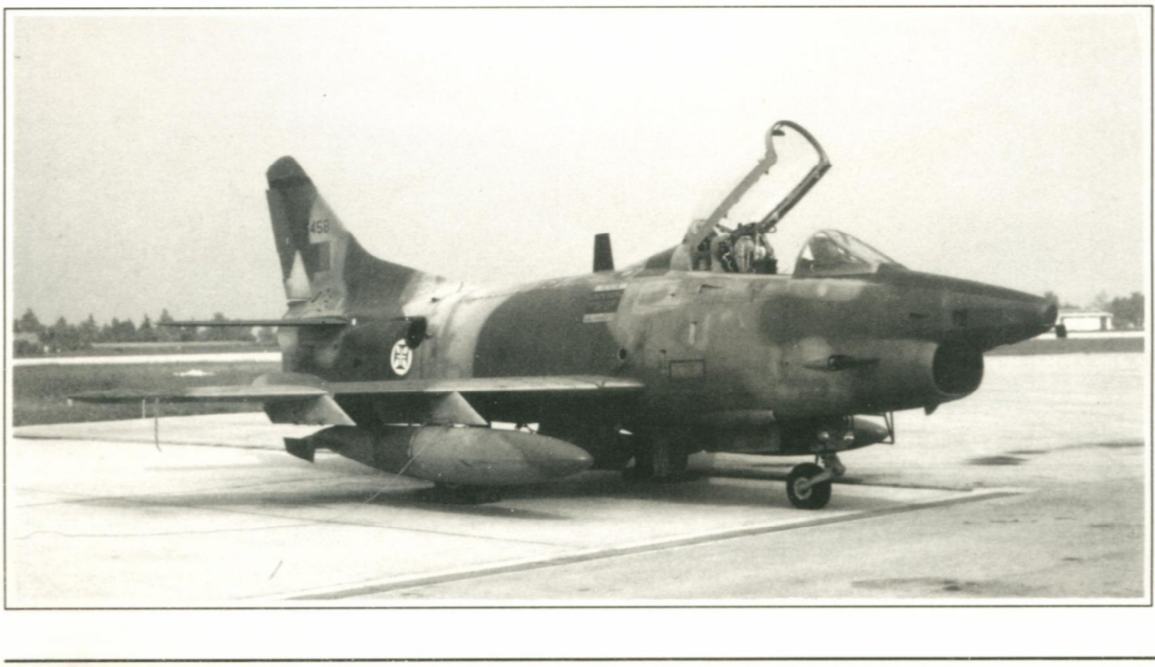


The three air forces which have used the G.91 –
Above: Italy, represented by a G.91R/1B of the 103° *Gruppo* photographed in May 1987 at Treviso Sant'Angelo. This unit converted soon after to the AMX
Giuseppe Fassari

Right: Germany, represented by DG-310, a G.91R/3 of LeKG 41
Via John Visanich

Below: Portugal, represented by a G.91R/3 (5458) of ex-*Luftwaffe* origin and photographed during '*Display Determination* at Treviso
Via Giuseppe Fassari





CHAPTER FOUR

THE G.91 IN SERVICE

OPERATIONAL SERVICE WITH ITALY, GERMANY AND PORTUGAL

Fiat's 'little Sabre', as the G.91 became known affectionately by its users, was to see military service with three European air forces: Italy, Germany and Portugal.

Aeronautica Militare Italiana

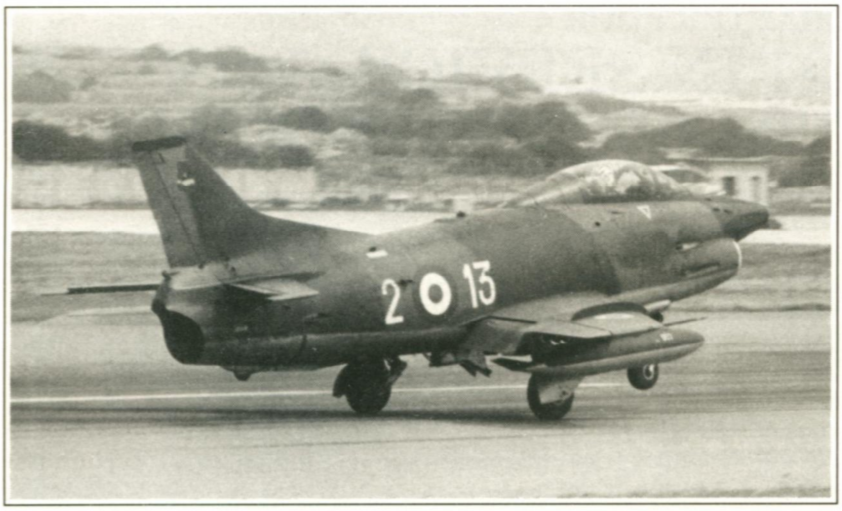
When 103° *Gruppo* was formed in August 1958 at Pratica di Mare, the 311° *Gruppo* of the RSV (*Reparto Sperimentale Volo* – Flight Experimental Unit) had already been testing the first and second prototypes of the G.91, coded RS-01 and RS-05 respectively, at the same air base which was actually the RSV's home base. The two units may be considered to have been formed to introduce the type into service, operating only prototypes and pre-production machines. The first unit to receive the G.91R/1s was the 14° *Gruppo* of the 2ª *Aerobrigata*, which relinquished its Sabre Mk.IV and re-equipped with the new type in March 1961 at Treviso-Sant'Angelo, where in the meantime the 103° *Gruppo* had also transferred. The 14° and 103° Gruppi joined to form the *Reparto Volo G.91* of the 51ª *Aerobrigata* in October 1962.

With the restructuring of the AMI in October 1964, the 14° *Gruppo* (156ª, 157ª, 158ª *Squadriglie*) and the 103° *Gruppo* (210ª, 213ª, 247ª *Squadriglie*) formed the 2° *Stormo Caccia Tattici Ricognitori Leggeri* (CTRL – Light Tactical Reconnaissance Fighter) at Treviso-Sant'Angelo, equipped with G.91/R1, R/1A and R/1B. The original CTRL designation was later modified to CBR (*Caccia Bombardieri Ricognitori* – Reconnaissance Fighter Bomber) which was more in consonance with the aircraft's role.

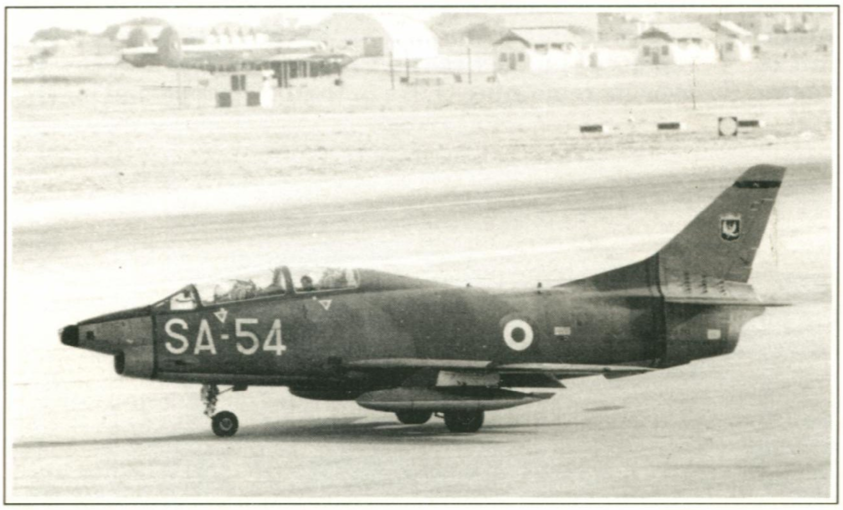
It was only in the summer of 1989 that the new AMX replaced the G.91 in the 103° *Gruppo*, the unit turning over its remaining G.91s to the 14° *Gruppo* and moving

Right: A pair of G.91Rs of the 32° *Stormo* based at Brindisi take-off from Malta's airport after a brief visit. They are coded 32-5 and 32-8
Charles Stafrace

Below: 32-1 of the same unit is seen in the fine Spring weather of 1970 at Malta's Park No 4
Charles Stafrace



Left: A G.91R/1 of the 2° *Stormo* on take-off. The air intake lips are painted yellow
Charles Stafrace



Below left: A fateful day: June 18, 1971. Taxiing out of Luqa, SA-54 is seen during its last moments. Minutes later it overshot the runway without lifting off, crossed the perimeter road and burned out completely in a field. Luckily there were no casualties
Charles Stafrace

to Istrana, where it is at present an element of the 51° *Stormo*. The 14° *Gruppo* is still flying the G.91R and is scheduled to pass on to the AMX in 1991 and move to Rivolto.

The 13° *Gruppo* started to form part, administratively, of the 2ª *Aerobrigata* in March 1962, but it became an autonomous unit from the following October, under the administration of Cameri Air Base; it was only in March 1965 that it became attached to the 2° *Stormo CBR* for transition to the R/1B version of the G.91. In September 1967 the 13° *Gruppo* transferred to Brindisi where it became the operational element of the 32° *Stormo CBR,* a position it occupied until April 1974, when it re-equipped with the G.91Y version, an aircraft it still retains until replacement by the AMX at the end of 1991. (See further on for information and service use of the G.91Y)

Reference has already been made to the G.91PAN of the 313° *Gruppo Acrobatico 'Frecce Tricolori'*, the type serving faithfully until replaced with the 2-seat Aermacchi MB.339A in 1982. Based at Rivolto, in Udine (Northern Italy), the G.91PAN of the 'Frecce' won world-wide respect for their daring and precision flying. After leaving the aerobatic unit in 1982, the G.91PAN were passed on to the two *Gruppi* of the 2° *Stormo* to supplement their complement.

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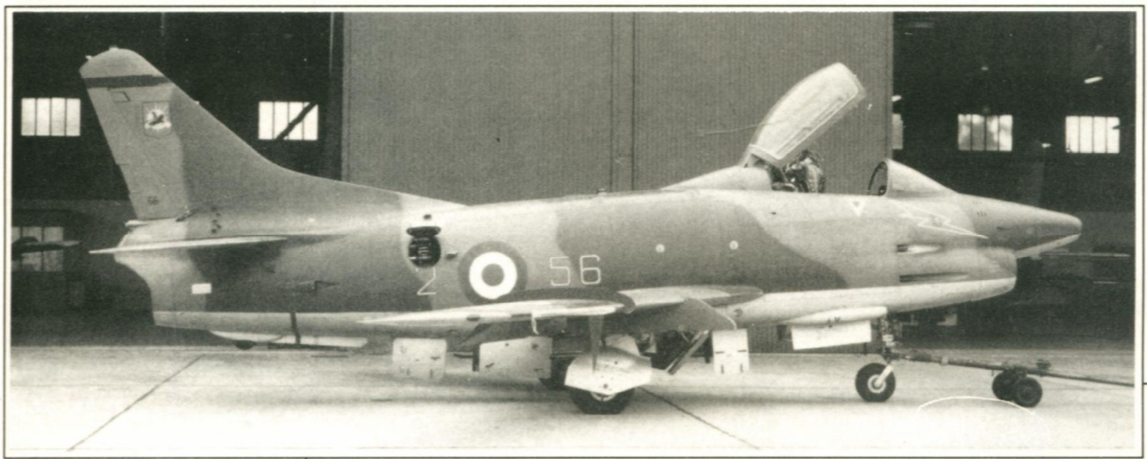
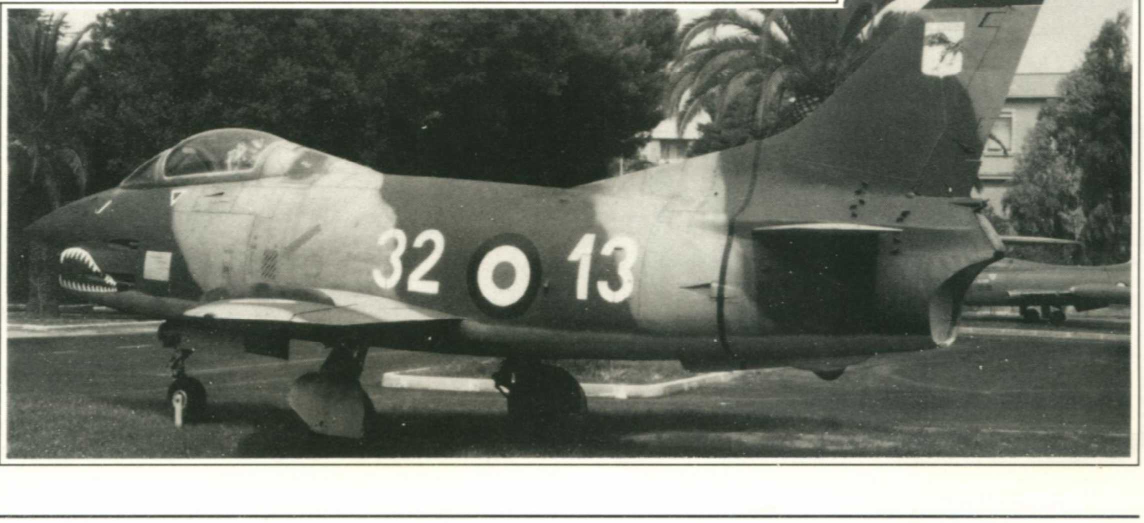
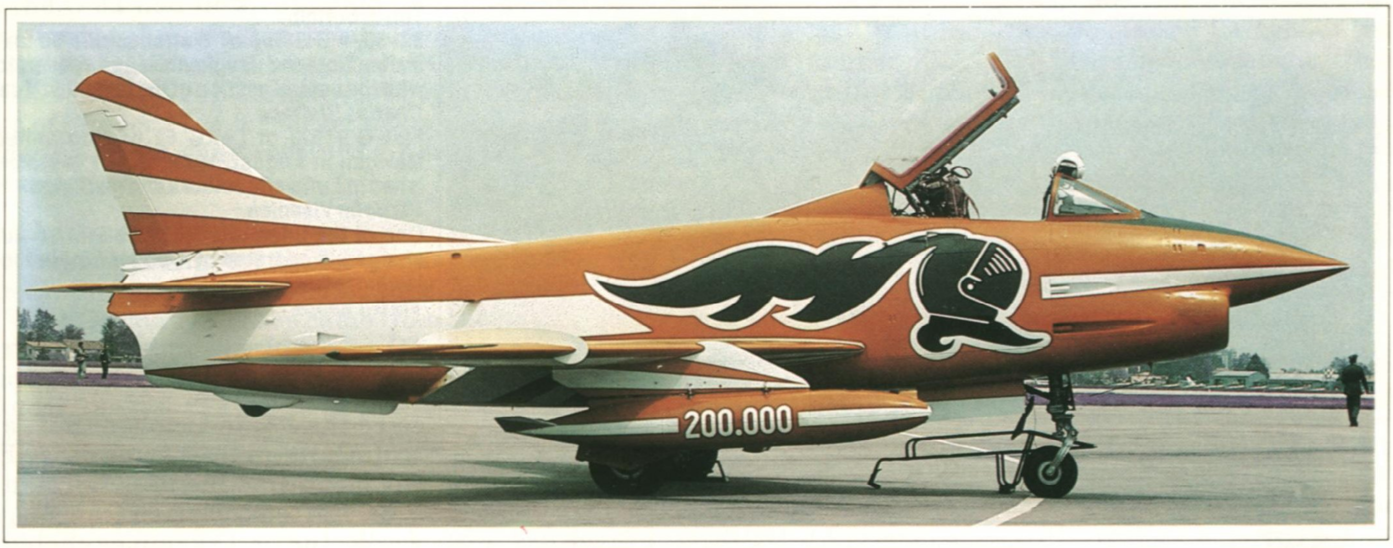




Above: Fresh after a major overhaul, 2-56 belongs to the 103° *Gruppo* and shows the low-visibility code markings
Via Giuseppe Fassri

Right: A nicely-decorated gate-guardian at Brindisi which was previously operated by the 32° *Stormo*. It is in actual fact a PAN and was one of ex-aerobatic team aircraft to go to operational units after the Frecce Tricolori received the Macchi MB.339, in order to bring numbers to full strength until the arrival of the AMX
Giuseppe Fassari

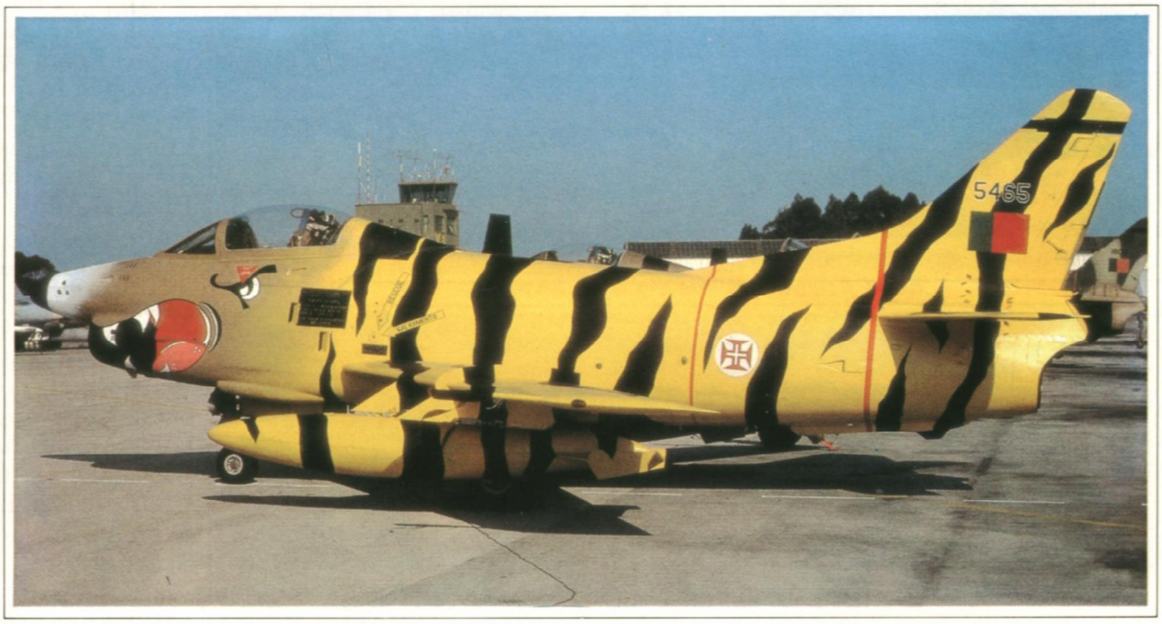


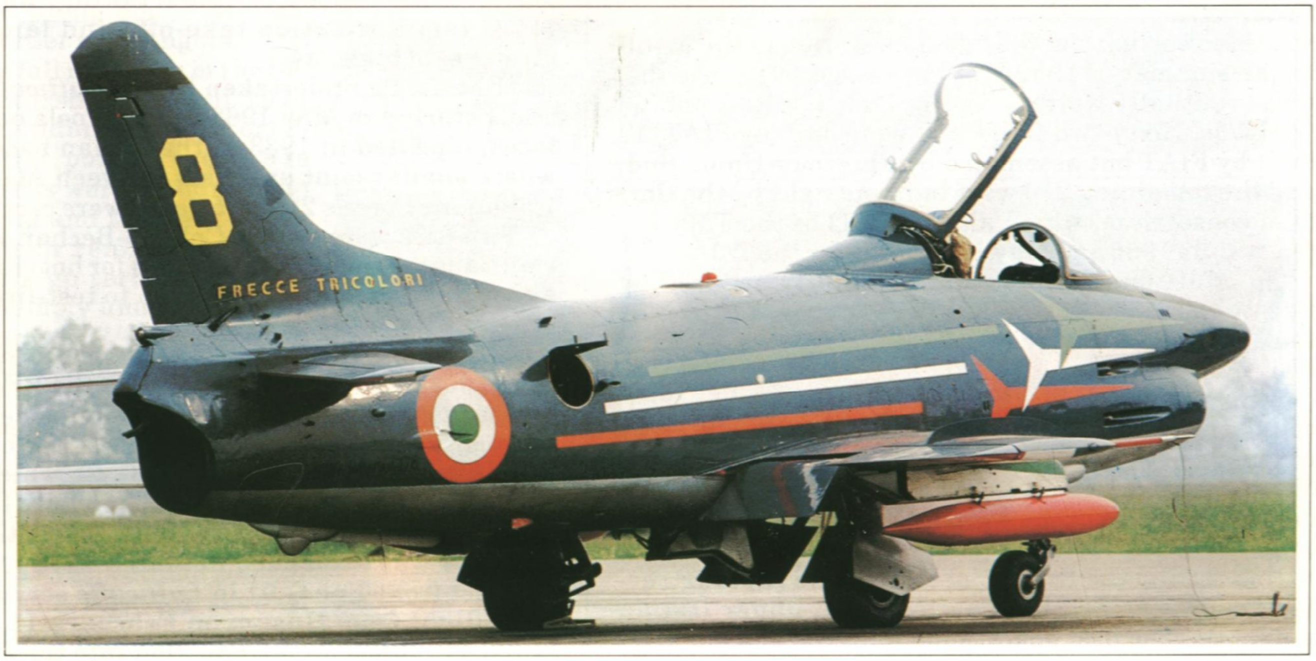
HIGHLY COLOURFUL G.91S

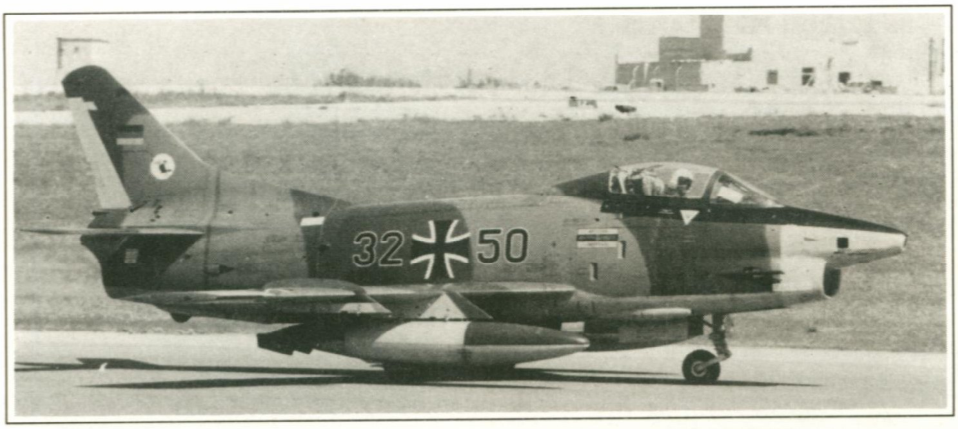
Top: G.91 (of the pre-series batch) carrying markings commemorating the 30th Anniversary and the 200,000th flying hours of the type. This was the last ex-G.91PAN to fly in Italy
Giuseppe Fassari

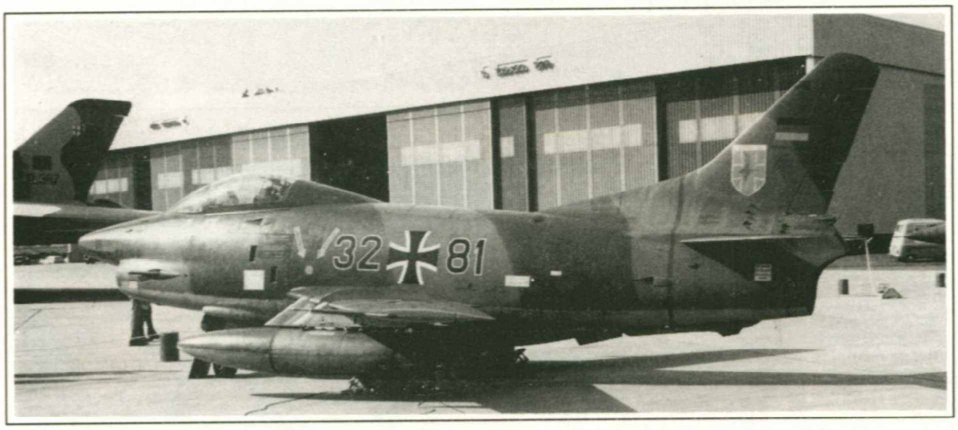
Right: G.91R/4 5465 of the Portuguese Air Force in a highly decorative colour scheme adopted for Tiger Meet 1987
Rembert Vornholz VDL

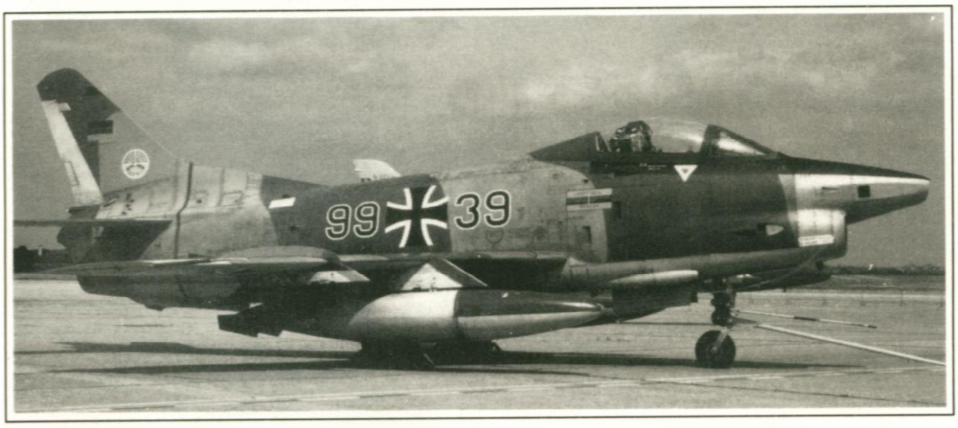
Below: No 8 of the *Frecce Tricolori* awaits another display











Top to bottom:
32+50, a G.91R/3 of *Waffenschule* 50 taxying at Malta. Note the dayglo nose and rudder, together with the central section of the fuel tank. June 1970
Charles Stafrace
Fiat G.91R/3 of LeKG 42 photographed at St Mawgan in August, 1973. 32+81 is typically finished in *Luftwaffe* colours and markings
Via John Visanich
One of the unarmed G.91R/3s still on *Luftwaffe* charge but operated by *Condor Flug* in the target-towing role
Via Giuseppe Fassari

Luftwaffe

As stated earlier, the G.91 demonstration in the Friuli in the summer of 1959 had impressed the Germans, who eventually were to receive 344 G.91R/3s and 66 G.91T/3s. Sixty-two of the R/3s were built by FIAT, 12 built by FIAT but assembled by Flugzeug-Union Sud, and the remaining 270 were built outright by the German consortium, which also built 22 of the T/3s, between July 1965 and May 1966 (1972 for the T/3).

In addition, the fifty R/4 originally ordered by Greece and Turkey but not accepted were taken over by the *Luftwaffe* and used for training purposes, particularly by WSLw 50.

First unit to receive the G.91R/3 in September 1961, consisting of 5 aircraft c/n NC.54-NC.58, was *Erprobunsstelle* 61, which coded its aircraft YA+011 to YA+015. This was an experimental unit, and it was only in early 1961 that *Waffenschule der Luftwaffe* 30 (code BA), later incorporated into WSLw 50 (code BD), with R/3s and the first T/3s, started the first instructor's course at Erding, near Munich, under Italian guidance. The first operational unit, *Aufklarungsgeschwader* (AG) 53, was created to receive the R/3 in October 1961, also at Erding, its aircraft being coded EC. In the meantime the first German-built R/3s started to arrive from Dornier's works, the first examples enabling the creation of another unit, AG 54, with codes ED, at Alhorn.

From then onwards, units re-equipped in quick succession with the *Gina*, as FIAT's little fighter became known: *Jadgeschwader* (JG) 72 coded JB at Husum; JG 73 coded JC at Pferdsfeld; *Leichtkampfgeschwader* (LeKG) 43 coded MC at Oldenburg; and LeKG 44 coded MD at Leipheim. JG 72 and JG 73 were later, in May 1964, redesignated LeKG 41 (coded MA) and LeKG 42 (coded MB) respectively, reflecting more realistically their operational capabilities. On the other hand, service of the G.91 with AG 53 and AG 54 was short-lived, their reconnaissance role being taken over by the newly-arrived RF-104G Starfighters.

In order to utilise the G.91's abilities in semi-prepared field operations, a small training unit, *Lehr-und-Ubungsschwarm* (LeU) G.91, with codes XB, was formed with the purpose of undertaking, among other tests, familiarisation take-offs and landings from stretches of highway.

Other tests undertaken by the *Luftwaffe* included trials started in May 1962 at Bad Toelz on grass surfaces, repeated in 1963 at the Italian base of Rivolto where similar joint exercises between AG 53 and the Italian Air Force's 2ª *Aerobrigata* were carried out.

Two R/3s were sent to Colomb-Bechar, in the Algerian Sahara, for 2 months in 1964 for hot climate trials, and the occasion was also taken to test-fire the AS.20 missile.

Apart from AG 53 and AG 54, whose reconnaissance role had earlier been taken over by the RF-104Gs, the replacement of the G.91R/3 by more modern types in *Luftwaffe* service started in April 1975 when the first F-4F Phantoms arrived for LeKG 42, which was then re-designated JBG 35. LeKG 43 and LeKG 41 adopted the Alpha Jet in 1980 and 1982 respectively while LeKG 44 was disbanded in March 1975 at Leipheim. The last front-line G.91 in *Luftwaffe* service made its final flight from Husum on February 11, 1982 with LeKG 41. Since its introduction into the *Luftwaffe* in

1963 the G.91 had flown 792,000 hours, the highest utilisation rate by a single aircraft being 3080 hours.

It is known that a small number of G.91R and T are still existent in West Germany. They are under the charge of *Condor Flug* for target towing duties but are *Luftwaffe* property and retain their original military codes and markings.

Fôrça Aérea Portuguesa

Requiring a close support aircraft for use in its colonies in Africa, Portugal purchased in 1966 forty G.91R/4s from West Germany. These came from the batch of 50 which had been built by FIAT for Greece and Turkey but not accepted and which had then been purchased by the *Luftwaffe*. The sale of the R/4s to Portugal formed part of a deal by which training facilities were made available to the *Luftwaffe* at Beja, in southern Portugal.

Although the sale contract stipulated that the G.91s were to be used only on Portuguese territory, this did not impede the Portuguese Air Force from operating the aircraft in the African Colonies which were astutely enough described as Portuguese sovereign territory.

The G.91R/4s were serialled 5401-5440 and their known previous West German code and construction numbers are given in the appropriate section. They first entered service in 1966 with *Esquadra de Caça* 10 at Base Aerea 10 (Beira, Mozambique), and with *Esquadra de Caça 12* at Base Aerea 12 (Bissalanca, Portuguese Guinea, later known as Guinea-Bissau), replacing F-84G Thunderjets and PV-2 Harpoons. The G.91s became quite popular with their crews, who used them in an anti-guerilla rôle in the African territories. By 1971 the G.91s were concentrated with *Esq*. 10 at Beira, but the type was also extensively used by *Esquadra de Caça* 9 at Base Aerea 9 in Angola, another Portuguese colony which was fighting for autonomy. It is estimated that at least five aircraft were shot down during these operations. It is claimed by some sources that G.91s made clandestine use of auxiliary bases along South Africa's northern border with Angola.

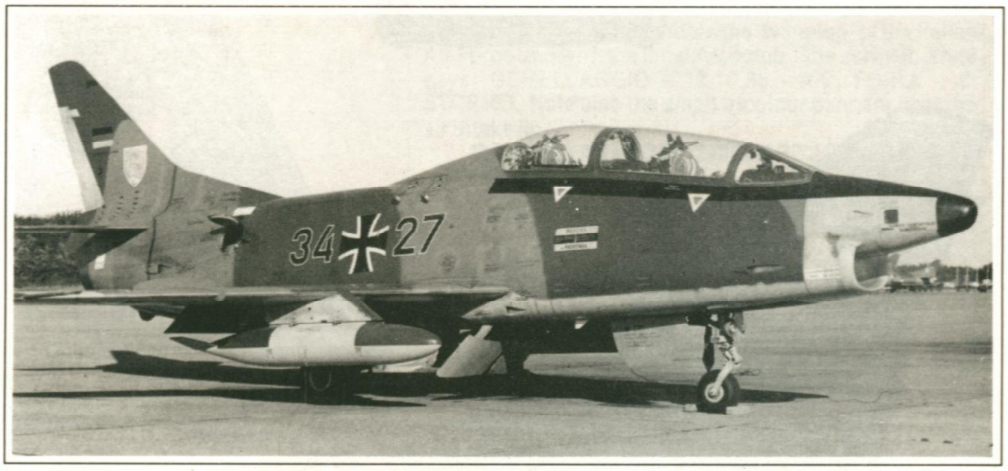
With the fall in Lisbon of the Selazar dictatorship in April 1974 and the abandonment of Portugal's colonial policy, the G.91s based overseas were withdrawn to the mainland and to Lajes, in the Azores, which remained Portuguese sovereign territory. However, it is reliably understood that at least four G.91R/4s were left in Angola by the withdrawing FAP in 1975 along with other equipment, the Fiats reportedly remaining in service until 1982 although their operational serviceablity has always been put in question.

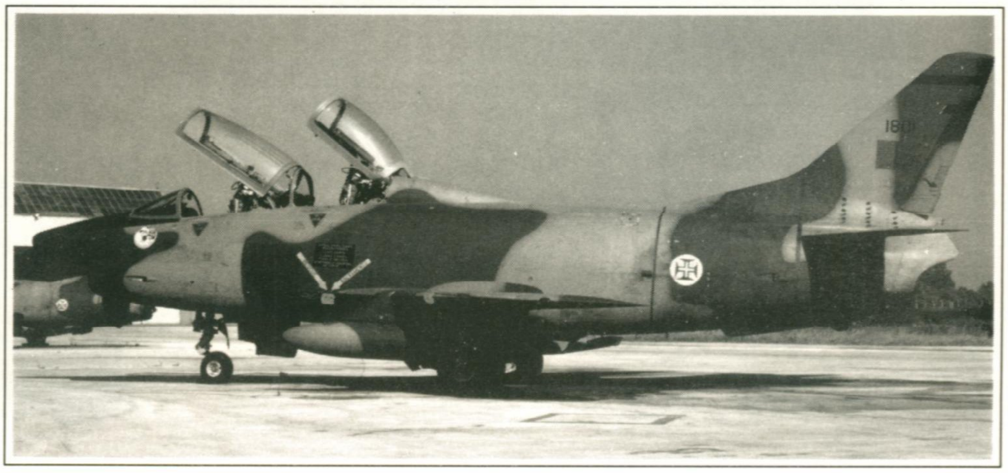
The G.91R/4 was destined to remain the only respectable combat aircraft of the FAP for several years, albeit in ever-diminishing numbers. It was therefore by good fortune that in the summer of 1974 the *Luftwaffe* offered for sale at low price a number of G.91R/3s which were being retired from front-line service. The Portuguese grasped this opportunity to replenish their stocks of G.91s and took up the offer. Subsequently the FAP bought more G.91s from West Germany as these became surplus, reaching a total of 96 by the time the last batch was received in 1982. This total included 33 R/3s and 11 T/3s, the rest being broken up for spares or used as decoys or as instructional airframes at several airbases. The R/3s taken in service were serialled 5441-5473 while the T/3s were serialled 1801-18711 (temporarily, they were first given serials in the 5400 range).

The new influx of G.91s enabled the formation of 2 full-strength units, *Esq* 301 *Os Jaguares* at BA 6 (Monatijo) with R/3s and T/3s and *Esq* 303 *Os Tigres* at BA 4 (Lajes, Azores) with R/4s and T/3s. The former unit is primarily tasked with close air support and interception duties, its aircraft armed with Sidewinder missiles, and also serves as the conversion unit for G.91 pilots. *Esq* 303 is entrusted with maritime patrol, particularly fisheries protection, reconaissance and air defence. Its G.91R/4s have been updated with modern avionics and Sidewinders to fill the interceptor gap until a new fighter became available. Being based far away in the Azores, *Esq* 303 *Os Tigres* cannot represent the FAP at NATO Tiger Meets, its place being taken by the equally capable 301 *Os Jaguares* which won the coveted Silver Tiger Trophy in 1985.

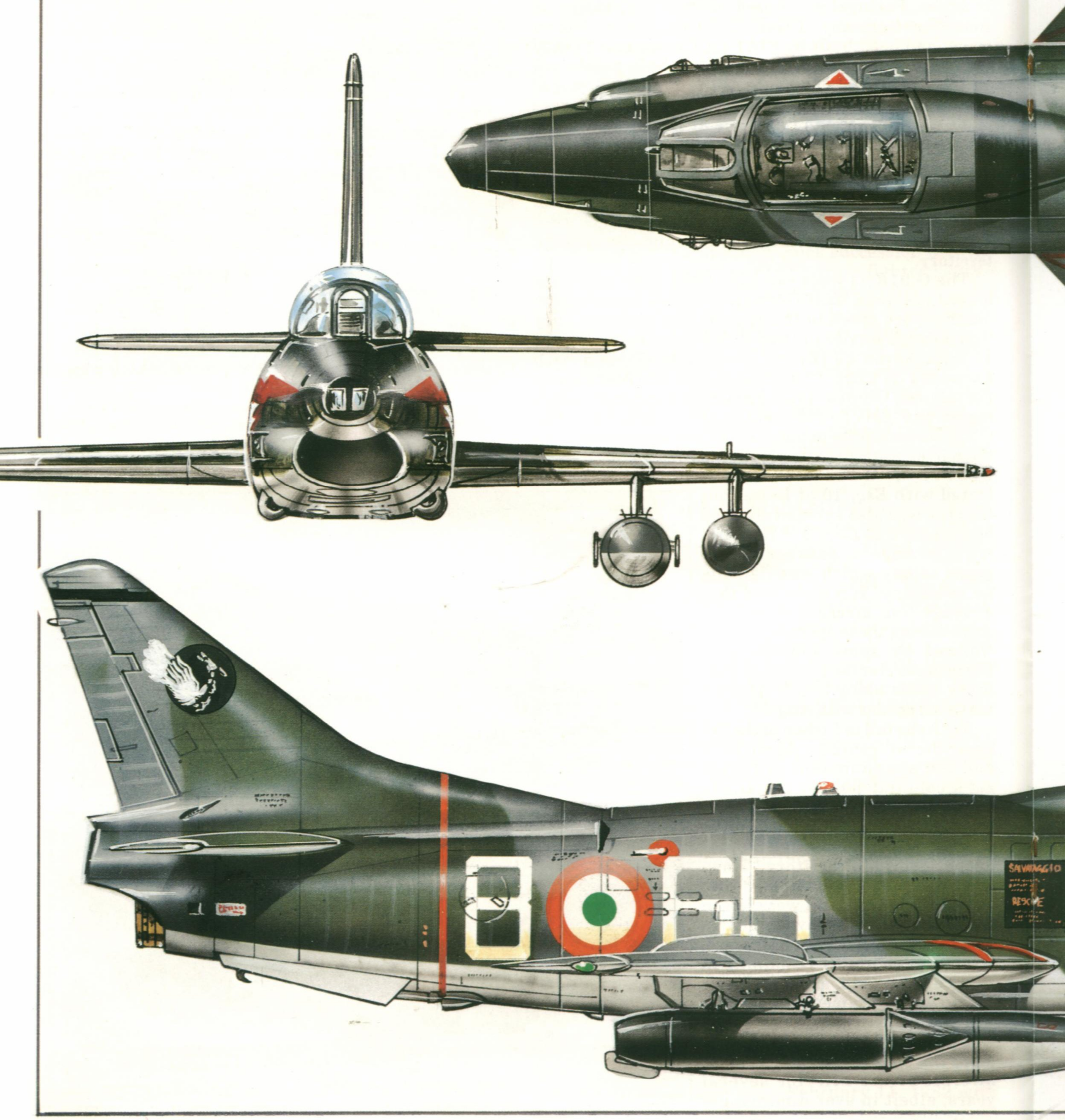
Below: G.91T, LeKG 43, 1971; note bulged rear canopy. ***Charles Stafrace***

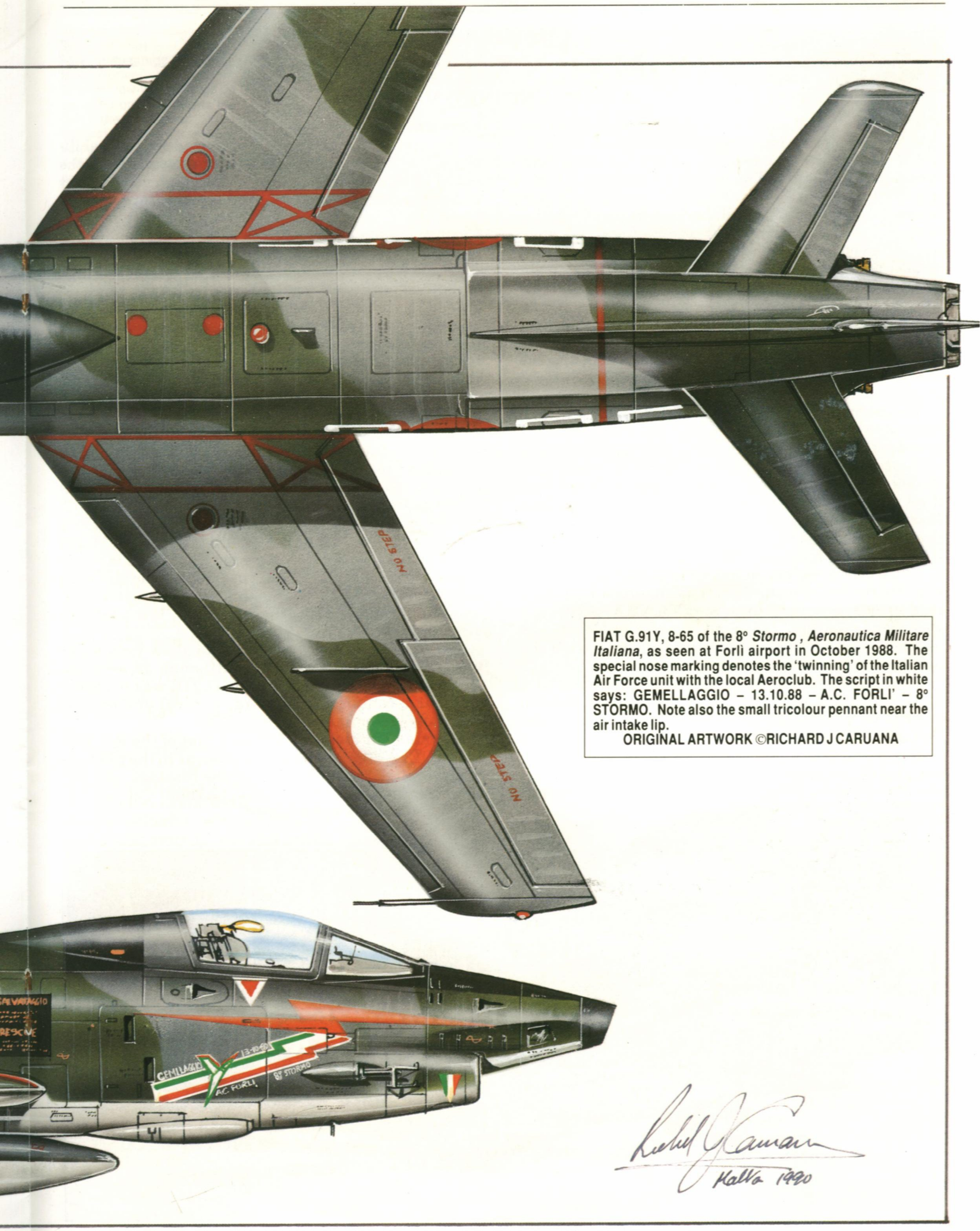
Bottom: 1801, ex-*Luftwaffe*, Esquadra 301, PAF. ***Via Giusepe Fassari***





FIAT G.91 Y





FIAT G.91Y, 8-65 of the 8° *Stormo* , *Aeronautica Militare Italiana*, as seen at Forlì airport in October 1988. The special nose marking denotes the 'twinning' of the Italian Air Force unit with the local Aeroclub. The script in white says: GEMELLAGGIO – 13.10.88 – A.C. FORLI' – 8° STORMO. Note also the small tricolour pennant near the air intake lip.

ORIGINAL ARTWORK ©RICHARD J CARUANA

Richard J Caruana
Malta 1990

CHAPTER FIVE

FROM GINA TO YANKEE

A TWIN-ENGINED VERSION

When FIAT announced in 1965 that it was developing an improved version of the G.91 in response to a specific AMI requirement for a light reconaissance fighter-bomber, it all seemed surprising, firstly because the service was accepting a subsonic design which, after all, had its origins in the fifties, and secondly because an age had arrived when any self-respecting air force was expected to re-equip with supersonic fighters. France and Britain were already thinking of the Jaguar, started as the Breguet Br 121, and foreign sales of the American F-5 Freedom Fighter had even then started in earnest. Both these types were light, supersonic twin-engined fighters dedicated to strike and reconaissance. Indeed, some factions within the AMI and the Italian Government suggested licence production of the F-5.

On the other hand, the needs of the AMI at the time seemed to be similar to those which prompted the USN to order the A-7 Corsair II, which first left the ground in September of 1965. This too was not supersonic. Though heavier, emphasis was placed on good low-level subsonic speed for ordnance delivery rather than Mach 1 or more at altitude. Moreover, Italy was at the time involved in the later-discontinued VAK-191 V/STOL fighter project with West Germany, and the introduction of a comparatively cheap (£500,000 a piece with spares) indigenous fighter as an interim measure made good sense (as it turned out, the VAK-191 project was abandoned, but Italy joined Britain and West Germany in the MRCA project, later developing into the present-day Tornado).

It was therefore in the light of this reasoning that FIAT continued with the G.91Y, as the new version came to be known. (In 1969, FIAT joined with Italian Government-owned Finmeccanica-IRI to become known as Aeritalia).

Retaining the same semi-prepared field capabilities of its predecessor, the G.91Y was derived from the G.91T with its longer fuselage. Although very similar in outline, and some of the original structure does remain, the 'Y' is in fact a very different aircraft, not only because the fuselage had to be extensively modified to receive a pair of General Electric J85-GE-13 engines. This powerplant formula, using 2 jet engines of high thrust/weight ratio, resulted in a relatively small increase in weight of the power-egg versus a 60% increase in thrust at take-off. Moreover, it affords better flight safety and combat survivability in as much as it relies on two independent sources of energy, and gives the G.91Y a marked improvement in take-off distance and climb, and an increase in speed over its single-Orpheus-powered predecessors.

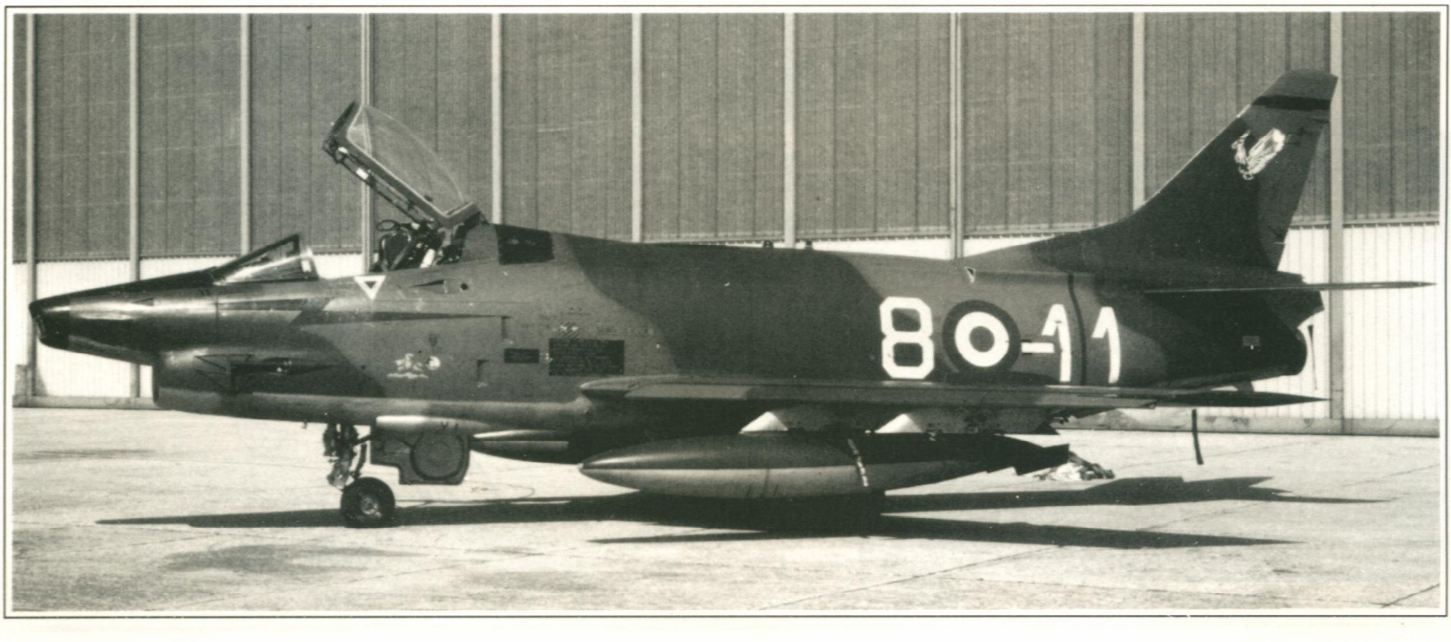
The longer length of the G.91Y permitted the doubling of the fuel capacity, since the space occupied by the second seat in the two-seater was utilised for fuel tanks, increasing the capacity from 462 gallons (2100l) to 704 gallons (3200l).

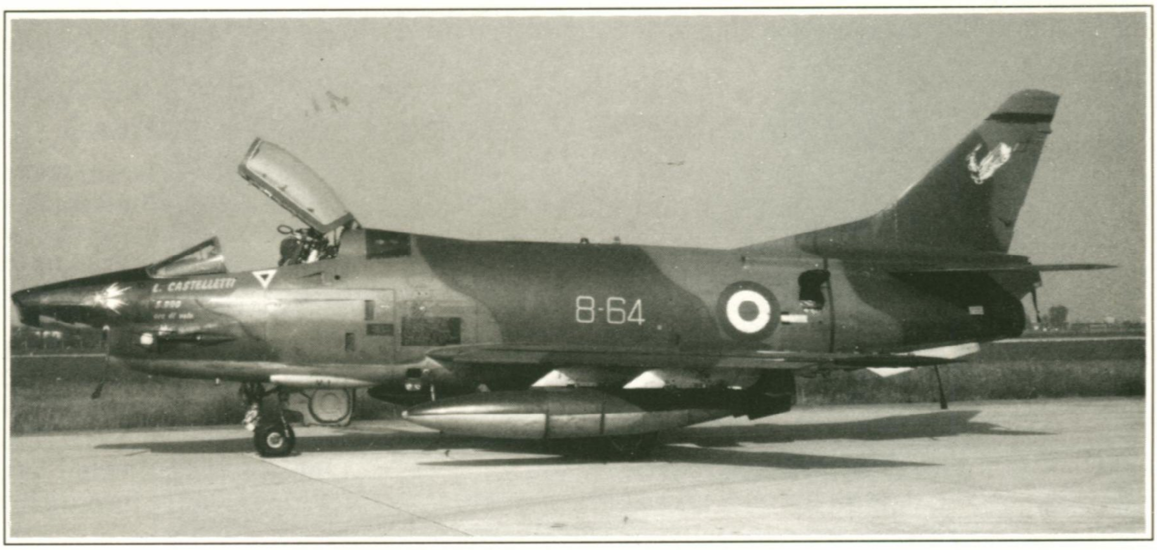
The wing was enlarged and strengthened to take 4 pylons under which up to 4000lb (1815kg) of stores could be hung. Full leading-edge flaps were incorporated, enabling a notable improvement in the aircraft's short field capabilities. For this purpose, a strengthened undercarriage featuring larger, low-pressure tyres was introduced.

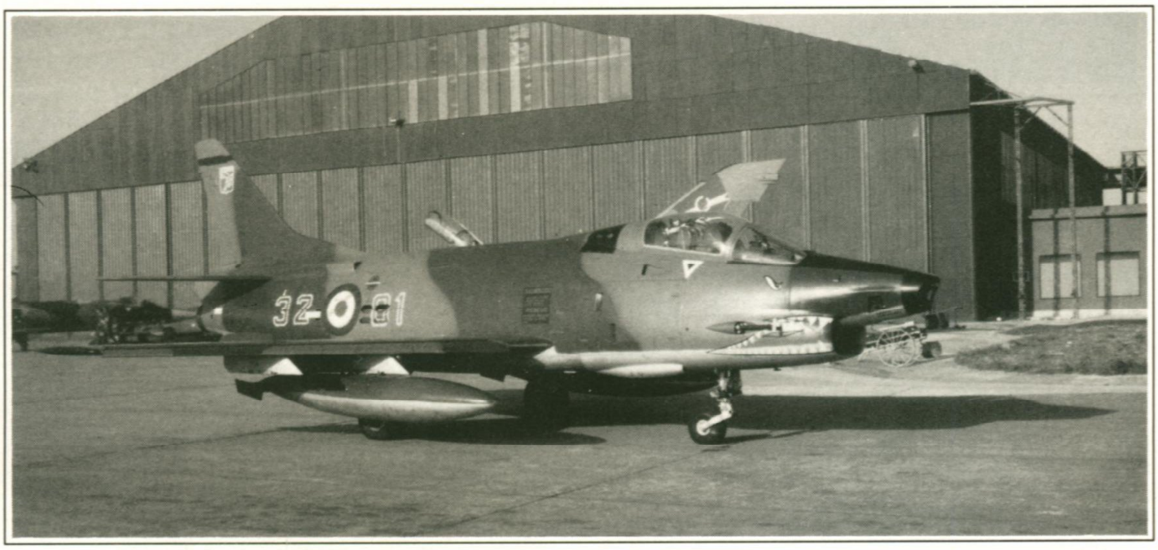
The nose cone was lengthened to allow for a wider variety of cameras to be used, although an arrangement similar to that used in the G.91R was normally employed, comprising forward, vertical and oblique sideways-facing cameras.

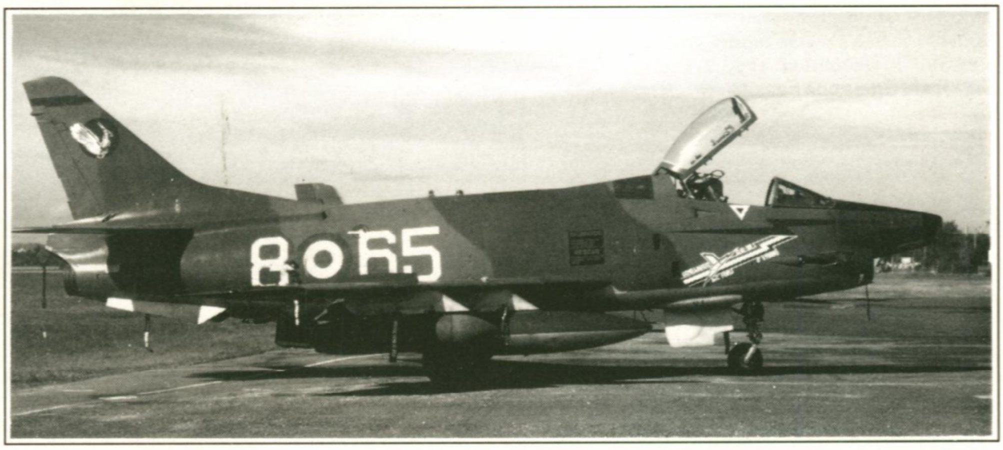
Aramament installed followed that of the R/3, that is two DEFA 30mm cannon situated, as in the previous model, on the forward flanks of the fuselage. An earlier intention to use four 0.5in (12.7mm) Colt Browning machine guns was dropped.

8-11, a fine example of the G.91Y of the 8° *Stormo* during a visit to Treviso. The hosting unit, 2° *Stormo*, took the opportunity to zap its badge in yellow on the gun bay door!
Via Giuseppe Fassari









Top to Bottom:
Low-viz markings for 8-64 of the 8° *Stormo*.
Different low-viz markings on the other unit to operate the G.91Y, the 32° *Stormo*.
Subject of the three-view colour painting on pp.20-21, 8-65, with the highly colourful nose markings
Giuseppe Fassari

It is to be noted that the G.91Y's Specto HUD gave the Italian Air Force its first experience of a head-up display.

The cockpit, like that of its predecessor, is roomy, armoured, air-conditioned and pressurised, and equipped with zero-zero ejection seat.

First flight of the prototype was made on December 27, 1966 at Caselle, followed by the second prototype in September 1967. The AMI, pleased with the results, ordered 20 pre-production aircraft, the first flying in July 1968 and flight evaluation by the *Reparto Sperimentale* of Pratica di Mare started that same month.

A two-seat version, the G.91T, was projected by FIAT, but this never materialised. Moreover, a modified version with more advanced avionics, with additional underwing store points and provision for Sidewinder missiles, the G.91YS, for evaluation by Switzerland as a Hunter replacement, was flown in October 1970, but the sale never came off. Switzerland instead ordered more Hunters and eventually ordered the Northrop F-5 in 1976.

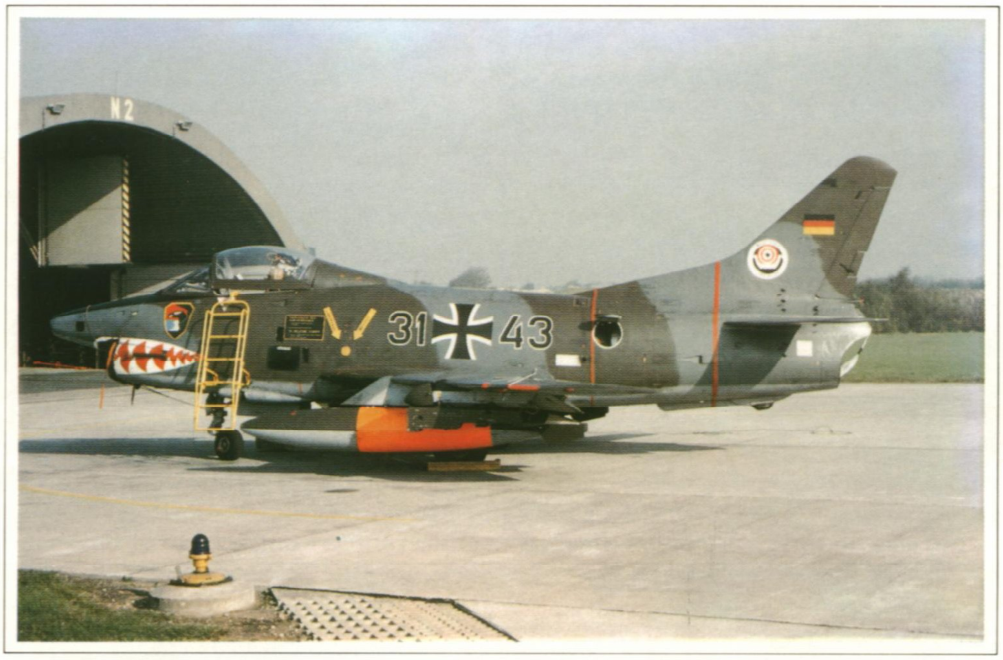
In Italian service, the G.91Y was first received, as already stated, by the *Reparto Sperimentale Volo* at Pratica di Mare. Apart from the two prototypes and twenty pre-production machines the AMI ordered 55 aircraft in two batches (35 and 20).

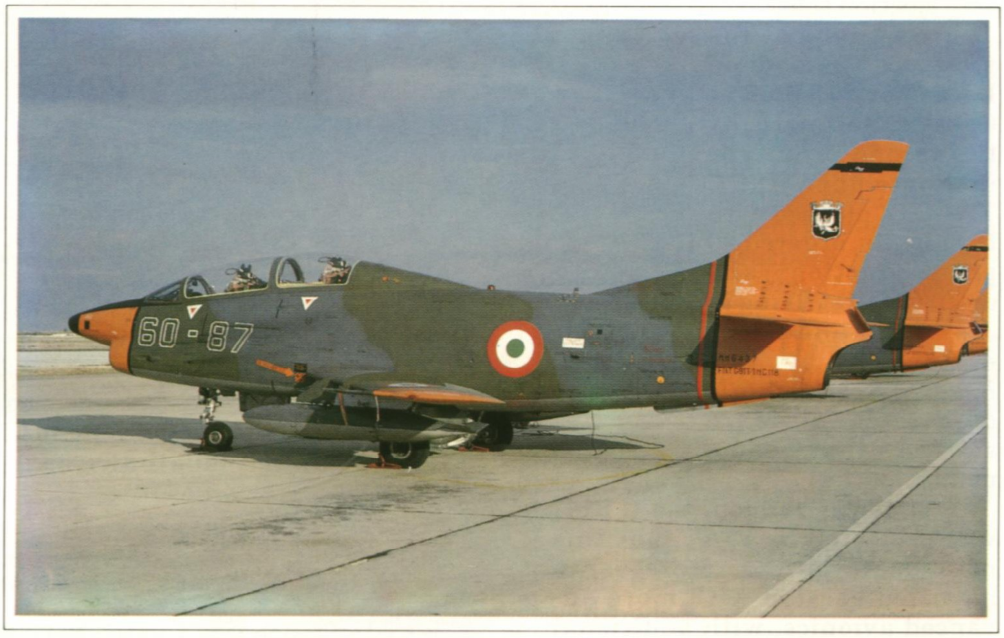
The first frontline unit to re-equip with the 'y' was the 101° *Gruppo* of the 8° *Stormo* based at Cervia, near Rome. This unit had been re-activated in September 1967 with ageing F-84F Thunderstreaks and started to receive the G.91Y on April 1970. Official delivery, however, took place on January 23, 1971. The unit celebrated with an airshow, and complete re-equipment took the best part of 1971.

Owing to a series of problems met by the 101° *Gruppo*, the next unit to receive the G.91Y could only do so four years later, in April 1974, when the 13° *Gruppo* of the 32° *Stormo* relinquished its G.91R/1s in favour of the 'Y' at Brindisi, where it had moved three years earlier in anticipation of re-equipment.

Both the 13° and 101° *Gruppi* still fly the G.91Y at the time of writing, transition to the new AMX being scheduled for 1991 and 1992 respectively. Apart from these two *Gruppi* and the RSV, no other units operated the 'Y'.

Production of the G.91Y ended in 1976, no further orders coming in either from Italy or overseas.



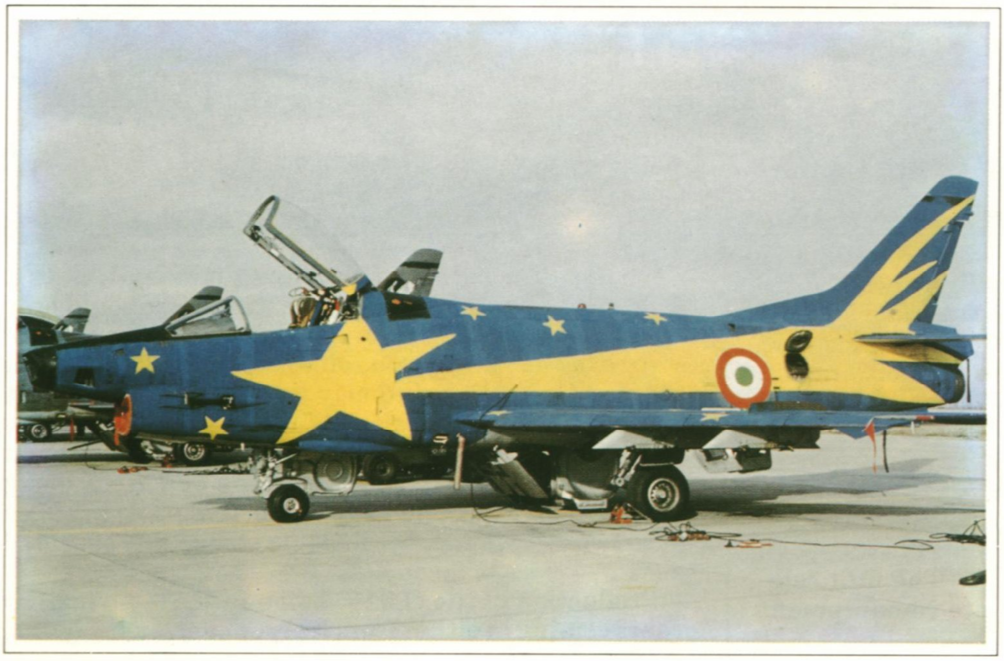


AT WORK AND AT PLAY

Above: G.91R/3 of LeKGT 41 in *Luftwaffe* markings complete with a very menacing sharkmouth. 31+43 carries another unidentified badge on the fin and underwing tanks with a dayglo centre
Via Giuseppe Fassari

G.91T in the typical trainer scheme which made the aircraft highly distinctive. In this case it is 60-87
Giuseppe Fassari

Below: A Christmas *Yankee*. This example from the 8° *Stormo* was repainted as a 'Christmas Star' in December, 1983
CMPR via Giuseppe Fassari



CHAPTER SIX

G.91 COLOURS

CAMOUFLAGE AND MARKINGS IN DETAIL

Born in a bright natural metal scheme, the G.91 was soon to appear in camouflage colours, when a trials unit under the auspices of NATO received their pre-production series of aircraft in the then standard NATO scheme.

Aeronautica Militare Italiana

The four G.91 and two G.91T prototypes were silver finished as were the pre-production machines until around 1960. The earlier G.91Ts, still in their metal finish, carried a bright red lightning flash along the fuselage. On such finished aircraft, unit codes (eg RS-01) were in black.

Single-seaters with operational units were finished in standard NATO Dark Green (FS.24079) and Dark Sea Grey (FS.26118/36173) with Light Aircraft Grey (FS.26373) undersurfaces and white codes. The 5ª *Aerobrigata* machines of 1958-1962 carried the usual '5' followed, after the roundel, by the last three digits of the serial number. Thus, MM.6266 was coded 5-266. Aircraft of this unit did not carry the Diana badge of the 5ª AB but the NATO motif on the fin. At major overhaul stage, the undersurfaces were left in natural metal.

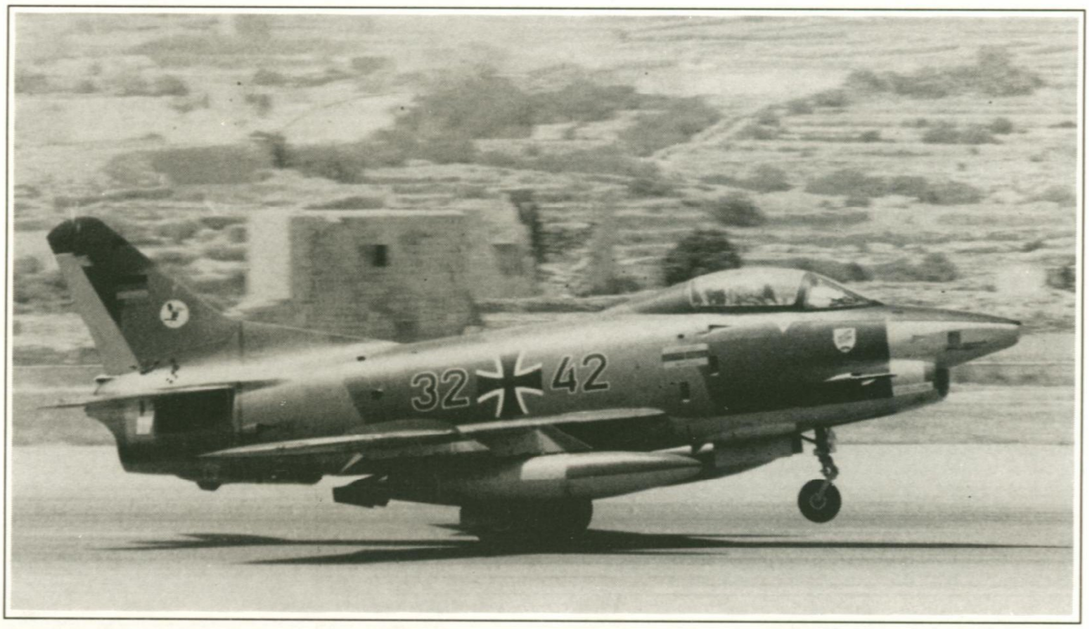
Later units carried normal AMI code markings on the fuselage, that is the number of the *Stormo* or *Aerobrigata* followed (after the roundel) by the individual aircraft number consisting of one or two digits which in no way had anything to do with the MM number. Aircraft of the *Reparto Sperimentale Volo* carried letters 'RS', while those of the SVBAA were 'SA', both codes followed by the individual aircraft number. Apart from the 5ª AB, *Stormo* or *Aerobrigata* badges were carried on the fin.

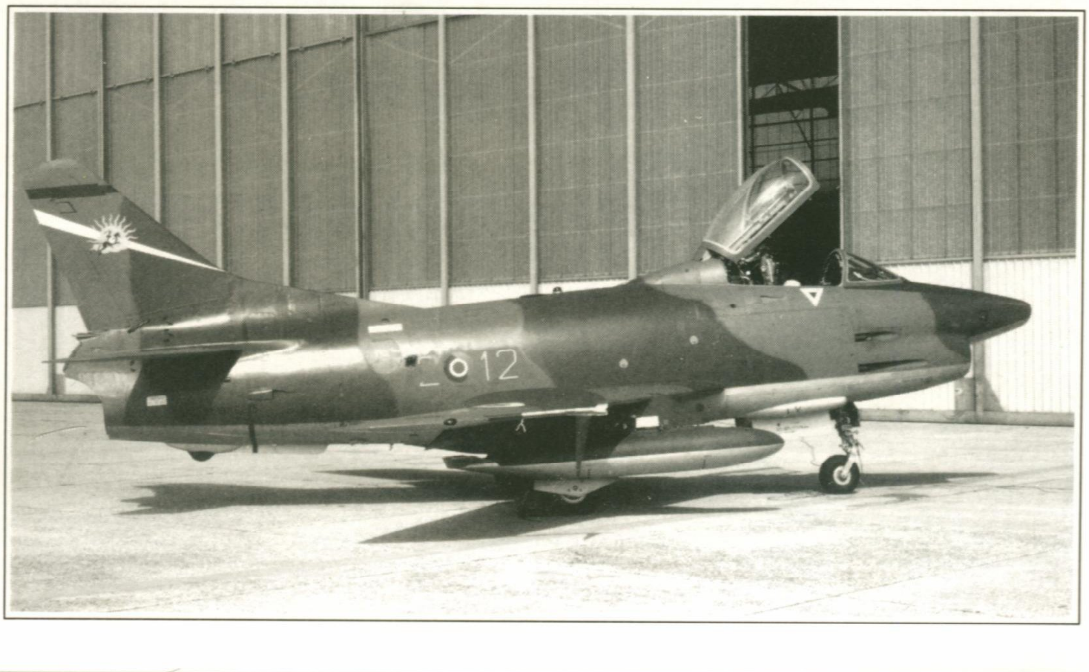
G.91T/1s, also camouflaged, usually had their nose, wingtips and rear fuselage, including tail surfaces, painted in bright orange (FS.22197). In these cases, the white codes were carried on the front fuselage, hyphenated.

Matricola Militare (MM – serials) and other writing were in 4in (10mm) black digits.

G.91Ys followed the same scheme, but in later years, the 8° and 32° *Stormi*, as well as the remaining T/1s of the 60a *Brigata Aerea* (ex-SVBAA) had their codes outlines only.

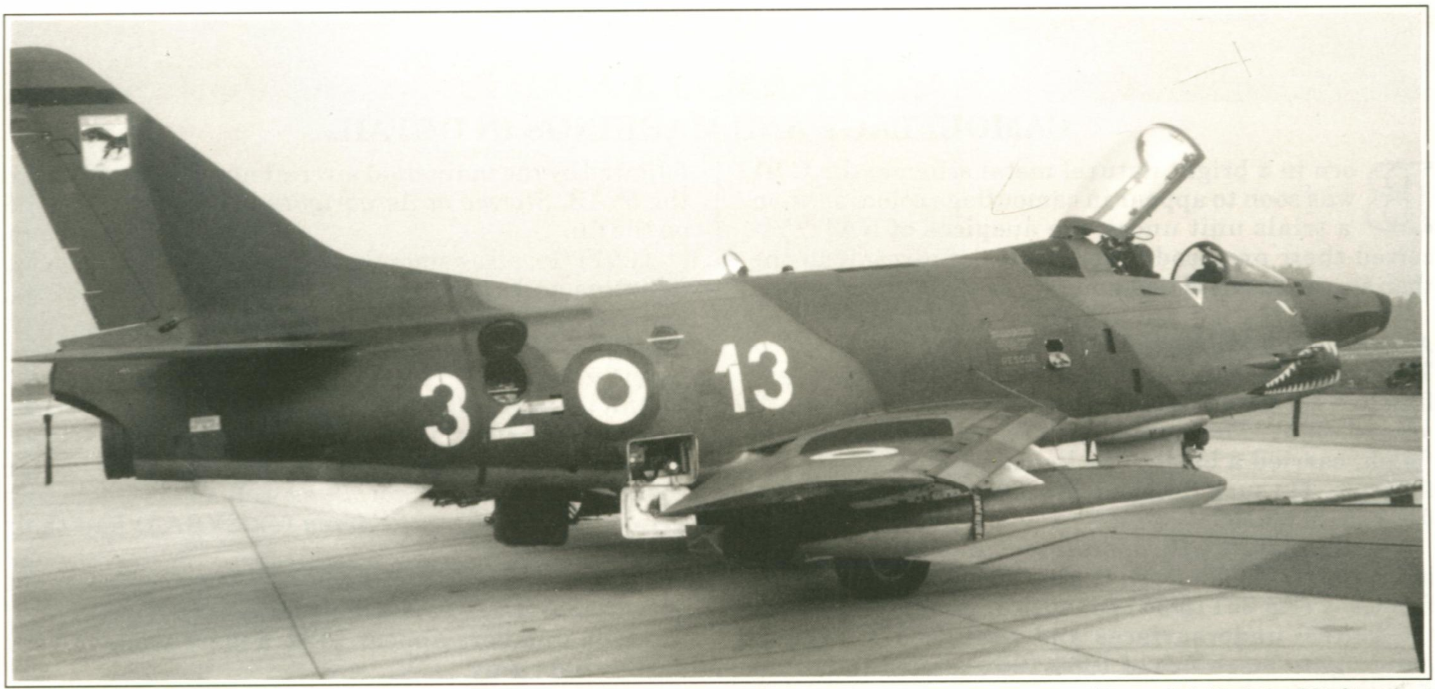
In the more recent craze to tone-down markings, all operational G.91s have acquired smaller roundels and the code numbers appear to be a mere trace in very narrow light grey.

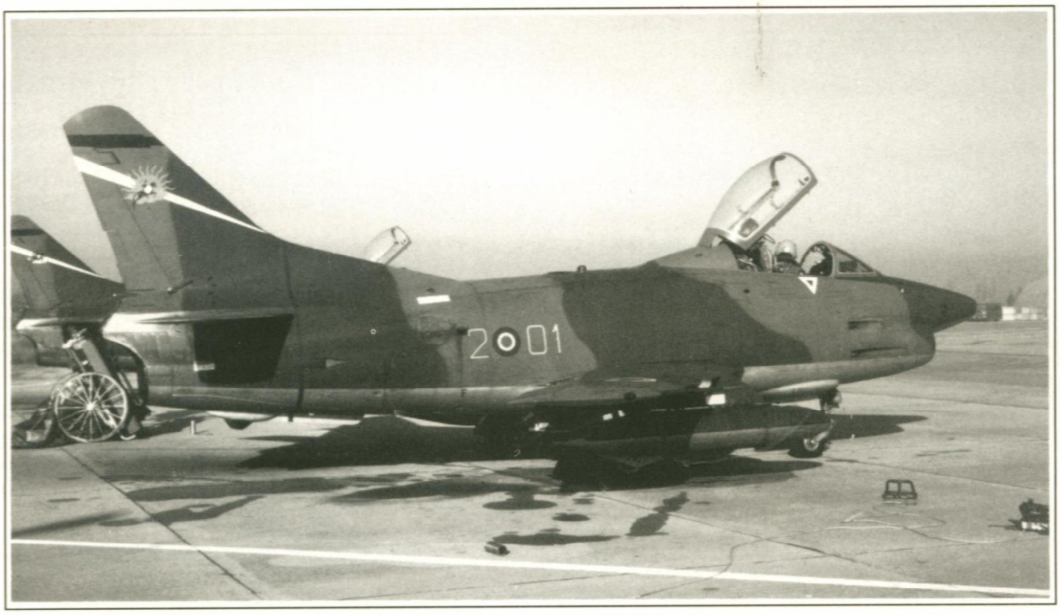




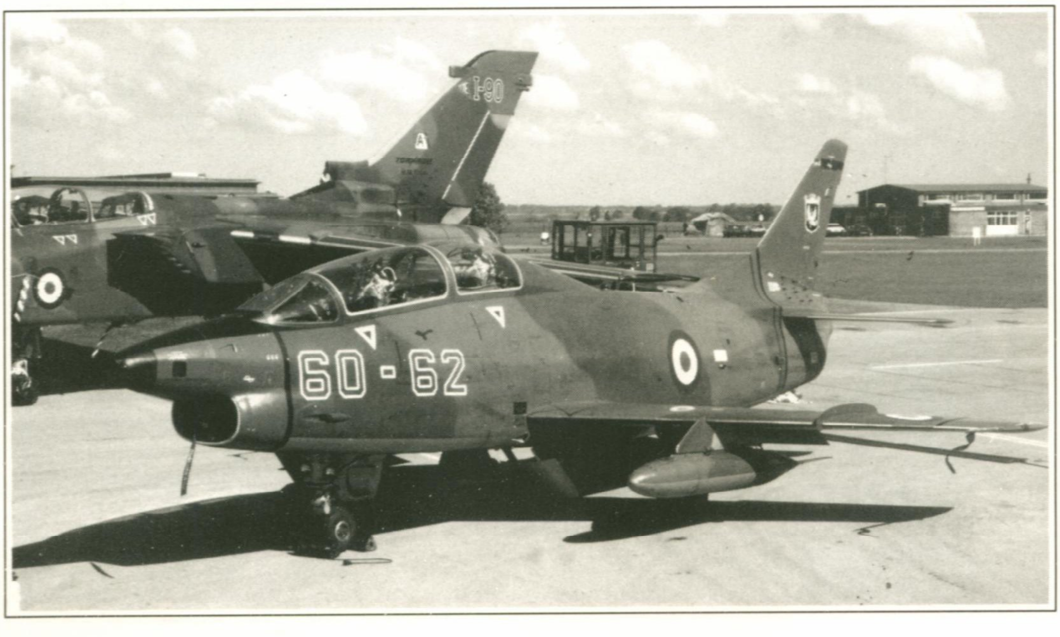
A direct comparison between *Luftwaffe* (top) and Italian (right) G.91s quickly reveals that the camouflage colours are reversed, though retaining the same pattern. This means that while they both use dark green and dark sea grey, the position of these colours in the overall pattern is changed.
The top photo shows 32+42 of *Waffenschule* 50 and apart from a nose marking denoting the school, also has a tail badge, the origins of which are not known
Charles Stafrace

The photo on the right shows a late version of markings on a 2° *Stormo* machine, 2-12, with low-viz markings and roundels of very irregular proportions
Giuseppe Fassari





Above: G.91Y of the 32° *Stormo* at Brindisi. Compare with the G.91R view at left – the *Yankee* carried an identical pattern to that of its single-engined brother
Via Giuseppe Fassari
Left: Another view of a 2° *Stormo* machine, this time 2-01 also in low-visibility markings
Via Giuseppe Fassari
Bottom: Beautifully trimmed and in perfect condition is the finish of 60-62, a G.91T of the 60ª *Brigata Aerea* photographed at Cottesmore during a courtesy visit. The edges of the dayglo areas around the nose, tail and wing-tips are marked out in black. Codes are in white outline only
Via Giuseppe Fassari



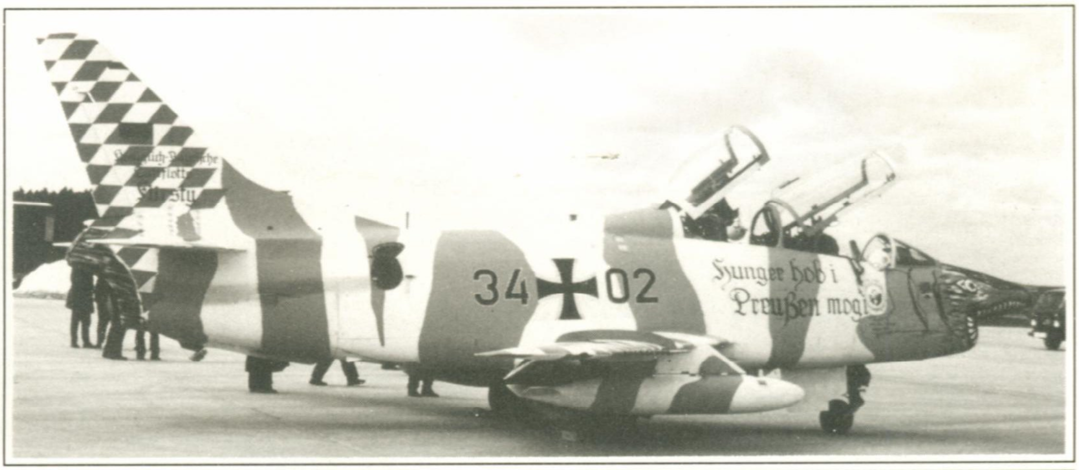
G.91PANs of the *Frecce Tricolori* were in the well-known blue with red/white/green trim.

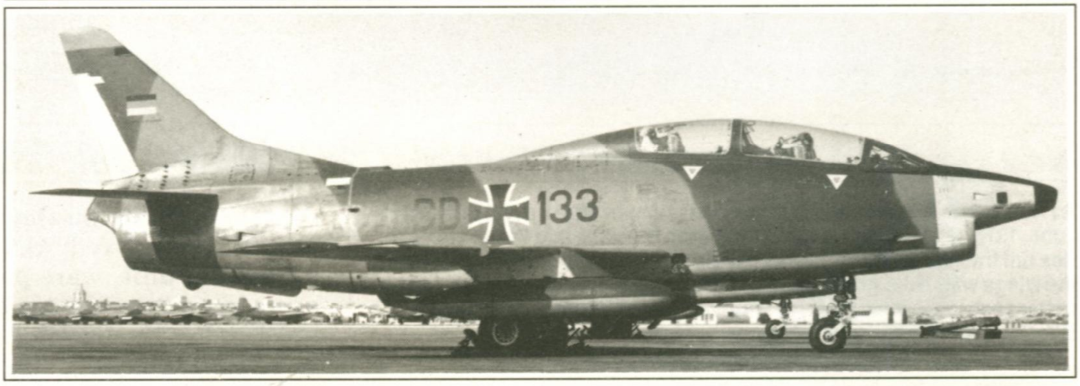
Luftwaffe

Camouflage colours are similar to those which were in use with the AMI: *Basaltgrau* RAL 7012 (FS.26152), *Gruenoliv* RAL 6014 (FS.24064), and *Silbergrau* RAL 7001 (FS.26373). Early unit codes (eg MC for LeKG 43 – see appropriate section for full list) and individual numbers, split by the *Luftwaffe* cross, were in black outlined in white. When the system was reviewed on January 1, 1968, the unit letters were replaced by a unified serial system, and it is therefore

Right: Even the G.91T could not escape the fate of a gaudy *Luftwaffe* colour scheme, in this case an all-white with light blue pattern finish, a sharkmouth around the nose and plenty of script. 34+02 was photographed at an airshow at Furstenfeldbruck
Via Giuseppe Fassari

Below right: Another 'T' in more sober colours, this time a *Waffenschule* 50 machine, 91-2-0034 photographed at Luqa, Malta on July 20, 1966
Via Richard J Caruana



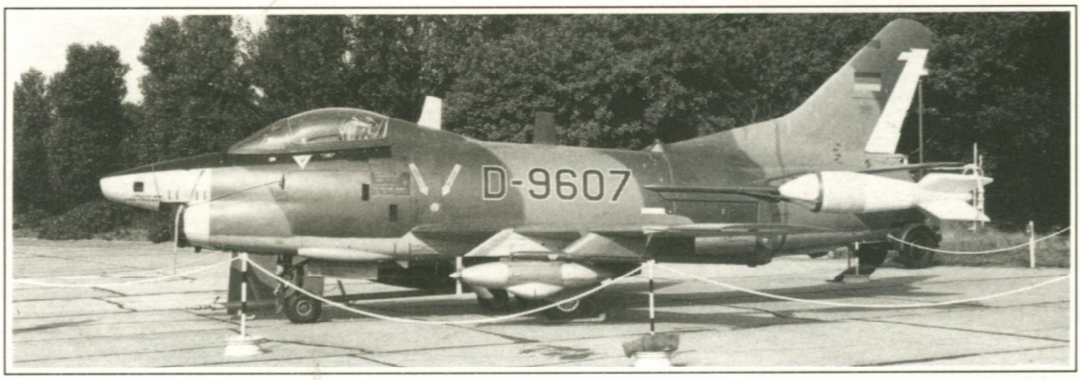


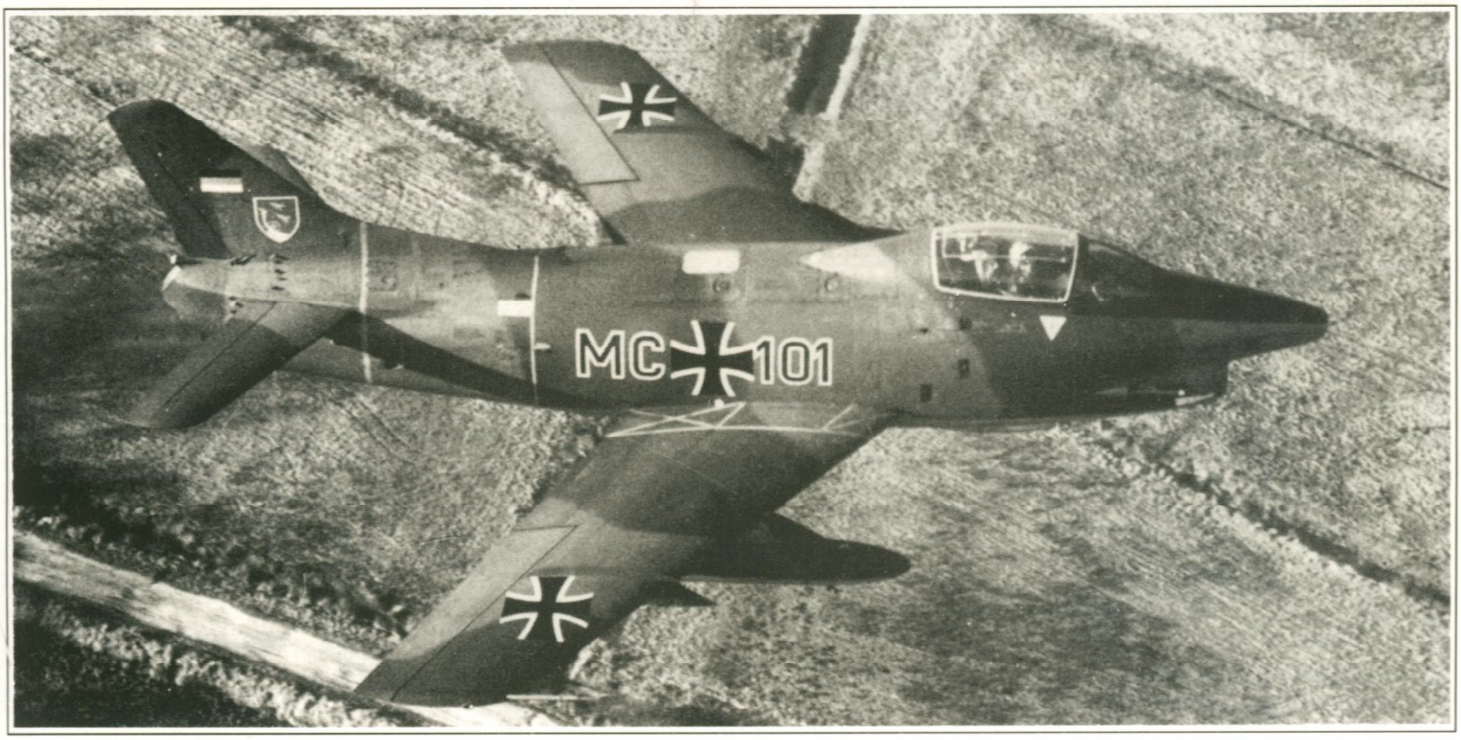
not possible, as is the case with the AMI, to identify the unit by reading the first two numbers of the 4-digit code. However, the *Luftwaffe* makes liberal use of *Geschwader* badges, usually on the fin but sometimes (as is the case with WSLw 50) on the front fuselage.

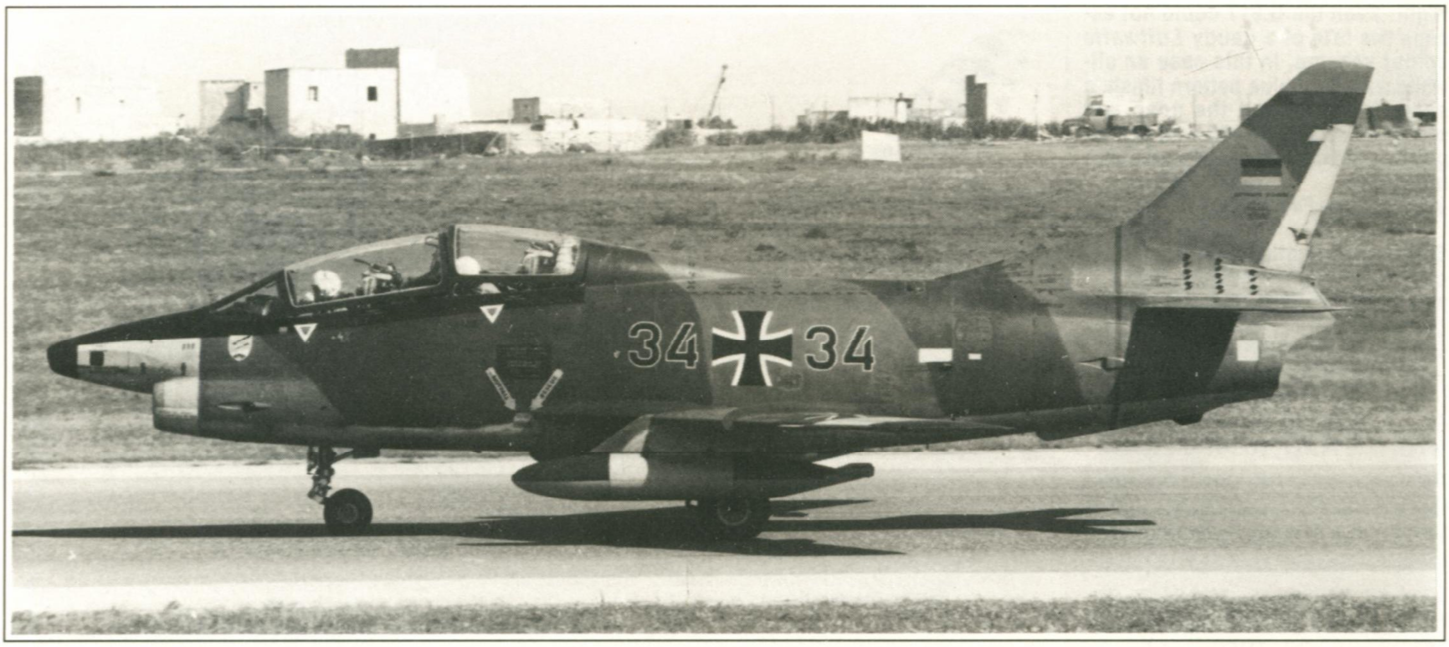
G.91T/3s also carried the bright orange areas (rather more reddish than the Italian hue) as in the AMI, ex-

Right: A G.91R without teeth! D-9607 is one of several unarmed *Ginas* operated by Condor-Flug for target-towing. The target is carried on the outer pylon and is coloured bright dayglo, the same as the nose, rudder and wing-tips
Via John Visanich

Below: Beautiful shot of an example from LeKG43 showing off its upper surface camouflage pattern to perfection
Via Richard J Caruana

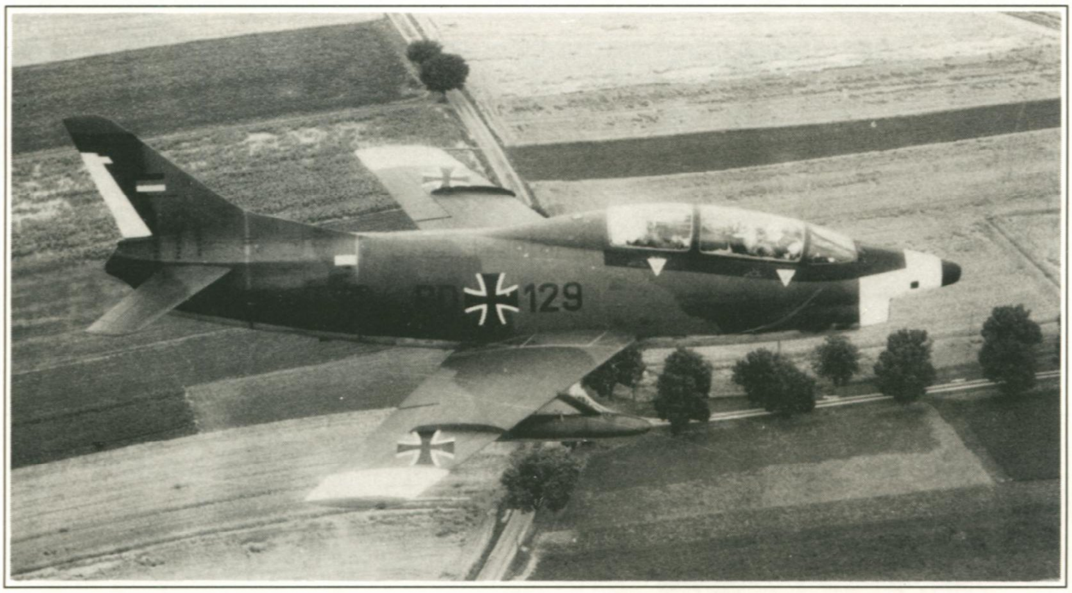




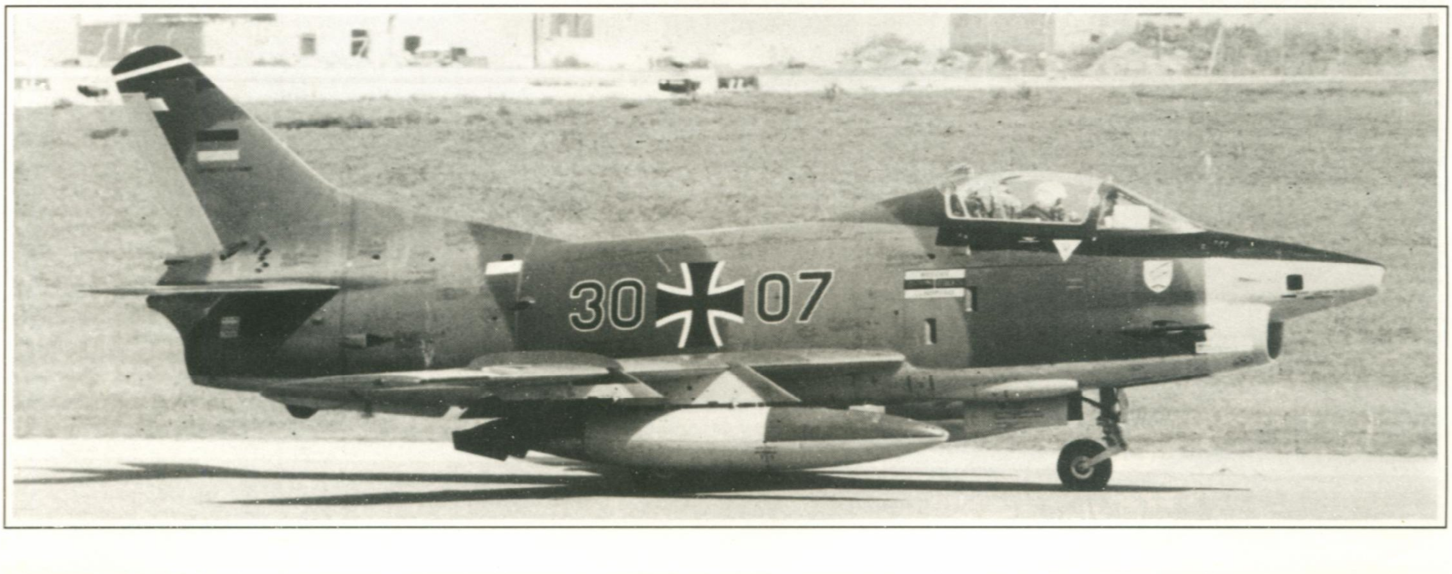


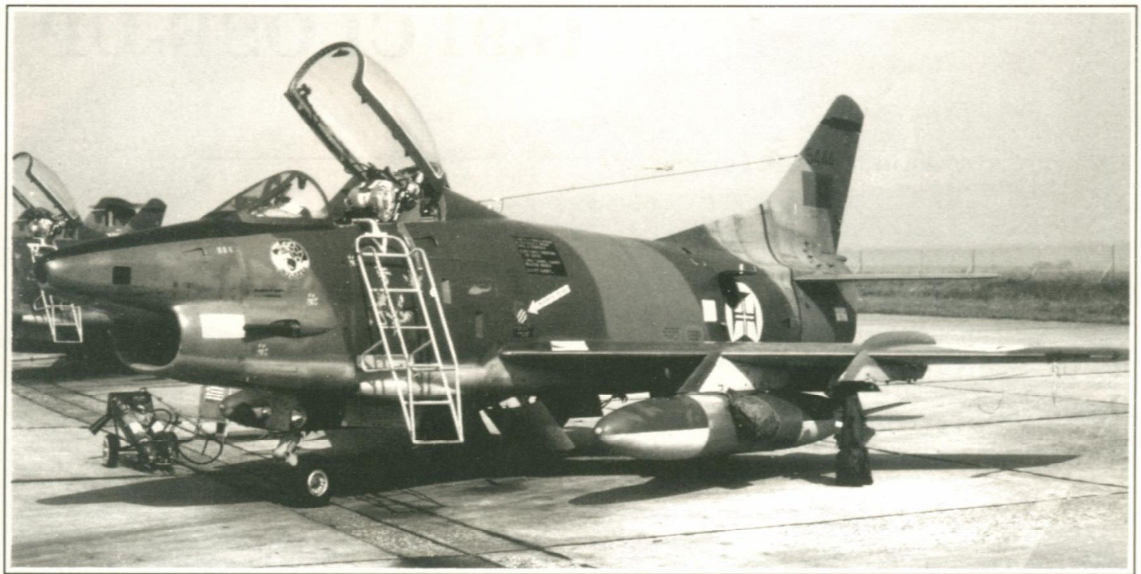
A FIAT G.91T, 34+34 of *Waffeschule* 50 taxiing in after arrival at Malta in June, 1970. The school badge is visible on the nose and the aircraft carries full trainer markings, that is dayglo nose, rudder and bands around the wings which did not actually extend to the whole wing-tip, as can be better seen in the view below of another *Luftwaffe* trainer in flight
Charles Stafrace

cept for the rear fuselage, where only the rudder was painted orange-red. G.91R/3s of WSLw 50, this being a training unit, were painted in this scheme too. In some instances, the tip of the fin was also painted orange-red on the training scheme.

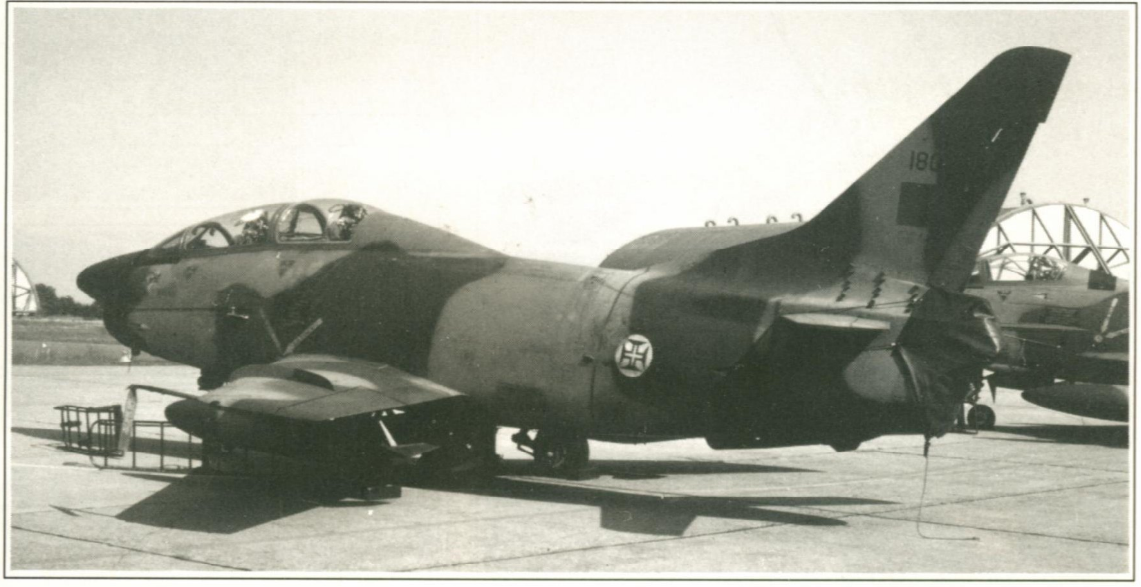


Below: Apart from two-seaters, the training school had also a number of single seat G.91R/3s, such as 30+07 seen here. To the standard camouflage pattern was added a liberal amount of dayglo, to the nose, rudder and wings, as also to a central section of the underwing fuel tank. Note that this particular example has a white band around the tip of the fin
Charles Stafrace





Right: 5444 *Gina* is here seen still wearing the German colour scheme of grey/green. It is also unusual in having an external fuel tank for a trainer, since it has a dayglo central section. The Jaguar badge on the nose identifies *Esc.* 301 - BA5
Via Giuseppe Fassari



Below right: Another Portuguese machine, a G.91T, in the tan and green scheme adopted by these aircraft after they come out of a general refit
Giuseppe Fassari

Fôrça Aérea Portuguesa

When originally delivered, the G.91R/4s and R/3s were left in the *Luftwaffe* camouflage, with the FAP serial number in small black digits above the fin-flash. The camouflage colours, however, were changed in the early eighties in favour of a 'NATO South' scheme of Dark Green (FS.24079) and Light Earth (FS.34021)with national insignia in a reduced size. The FAP is very much in favour of painting unit badges on their aircraft. For known serials of FAP G.91s see the appropriate section. It is also to be noted that these G.91s have on several occasions received impressive schemes for the Tiger Meet.

Royal Hellenic Air Force

The two aircraft built but not delivered were in standard NATO Dark Green (FS.24079), Dark Sea Grey (FS.26118/36173) and Light Aircraft Grey undersides (FS.26373). Standard Greek national insignia appeared on six positions plus fin flash. Aircraft 10109/NC.109 had '109' in black in large digits forward of the fuselage roundels, while the NATO motif appeared on the fin. 10109 was repeated in smaller black digits below the tailplane.

Fôrça Aérea Popolaire de Angola

No details have been traced. However, it is presumed that the aircraft retained the scheme left over from the FAP, that is NATO Dark Green/Dark Grey/Light Air Aircraft Grey. On its fighter types, the Angolan airforce normally uses a two-digit number prefixed by a letter, the letter 'C' indicating *Caça* (fighter).

U.S. Army

The G.91Rs evaluated by the US Army retained the NATO camouflage scheme with the following areas painted orange: wing tips, drop tanks, entire rear fuselage except for serial and 'US ARMY', and lower nose in gun-bay area up to but not including jet intake lip. 'US ARMY' and shortened serial (eg 0042 for 60-042) appeared on the fin in yellow. National US markings appeared in the usual four positions while 'ARMY' in white was painted below the cockpit.

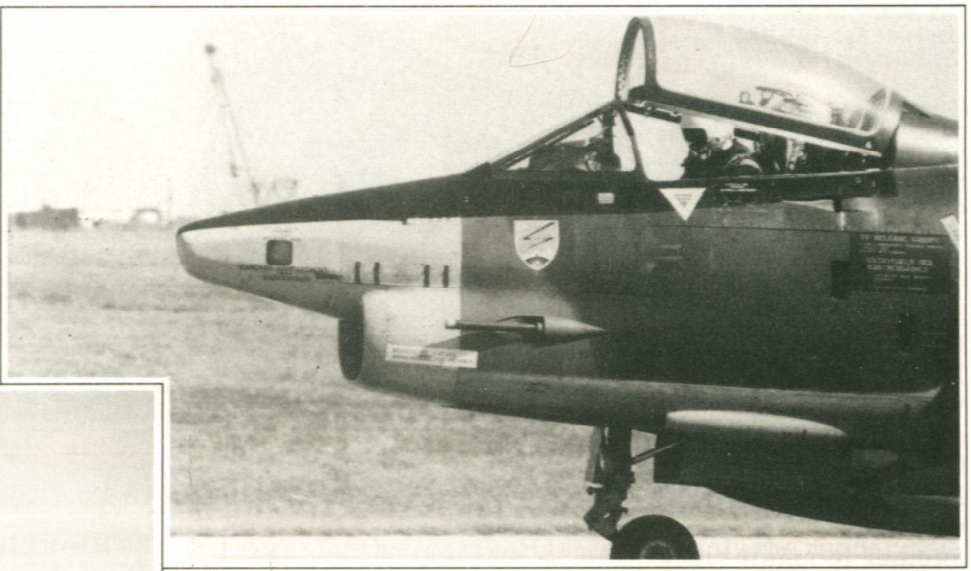
The only G.91T evaluated by the US Army was left in natural metal with a red lightning flash on the fuselage from jet intake to jet orifice, while orange areas similar to the G.91R were painted. Serial 0002 and 'US ARMY' appeared in black on the fin while ARMY in large letters was painted below the cockpit also in black. US national markings were on four positions. Known serials are 60-042 and 60-052 (NC.52/MM.6286) for the R/1; 60-065 (NC.65/EC+105) for the R/3; and 60-002 (NC.2/MM.6289) for the G.91T. In addition, R/1 NC.53 was evaluated by the USAF.

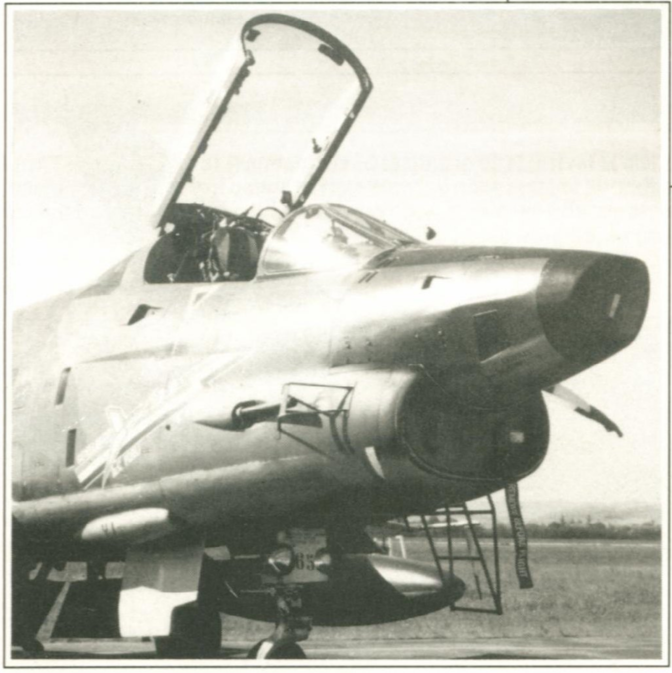
Bristol Siddeley

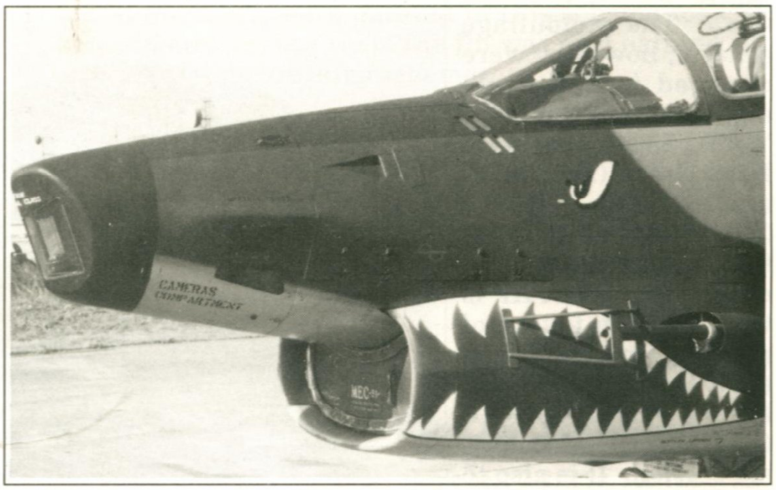
The two G.91s used by Bristol Siddeley (pre-production MM.6246 and R/1 MM.6285) carried standard Italian camouflage and national markings and British 'G' registrations G-45/4 and G-45/5. The NATO motif appeared on the fin. No other markings were carried.

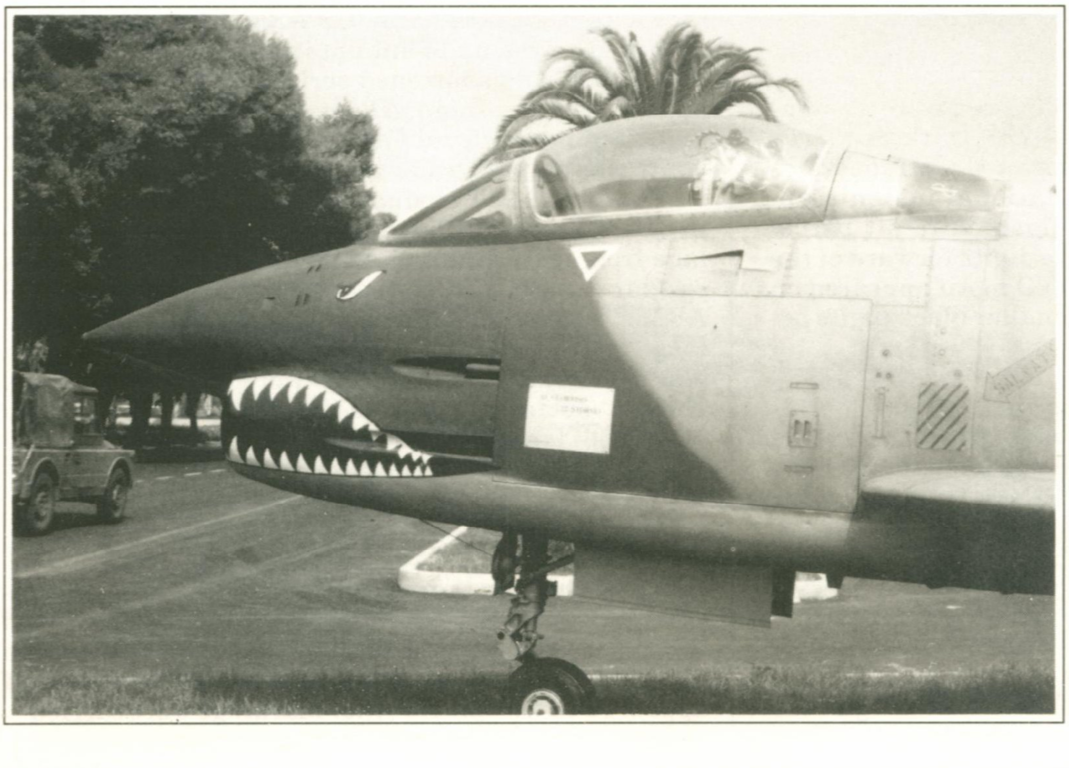
FIAT G.91 CLOSE-UP

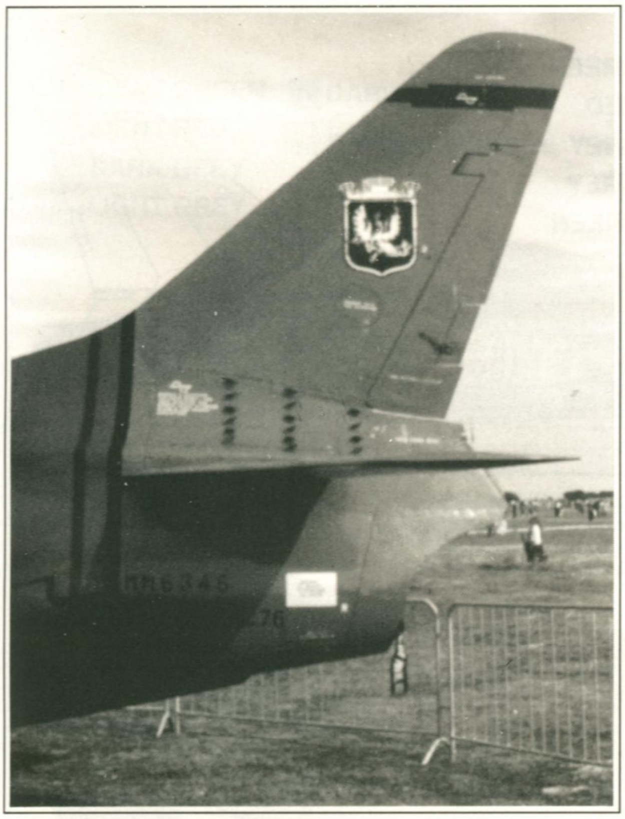
A study in G.91 noses: Right – G.91R/3 showing off the 30mm cannon
Charles Stafrace
Below – two views of the G.91Y's nose. Note the cannon guard in case the aircraft has to be arrested by the runway barrier
Giuseppe Fassari
Bottom: G.91PAN nose, similar to the pre-production aircraft which did not have any cameras in the nose-cone.
Giuseppe Fassari

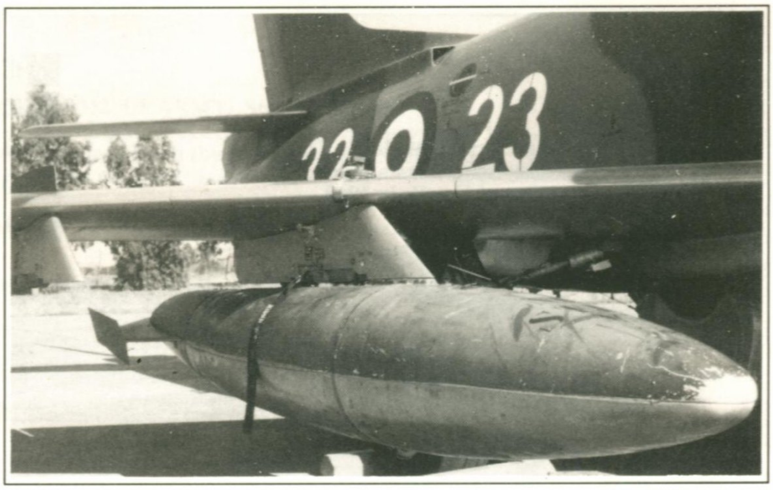


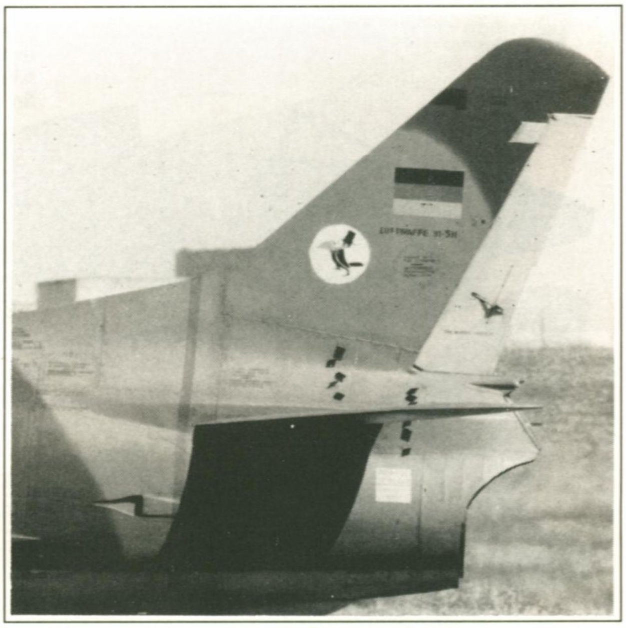


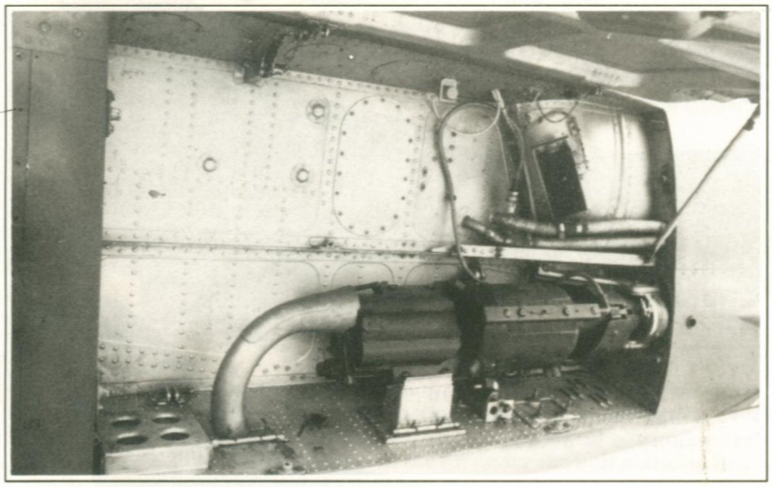


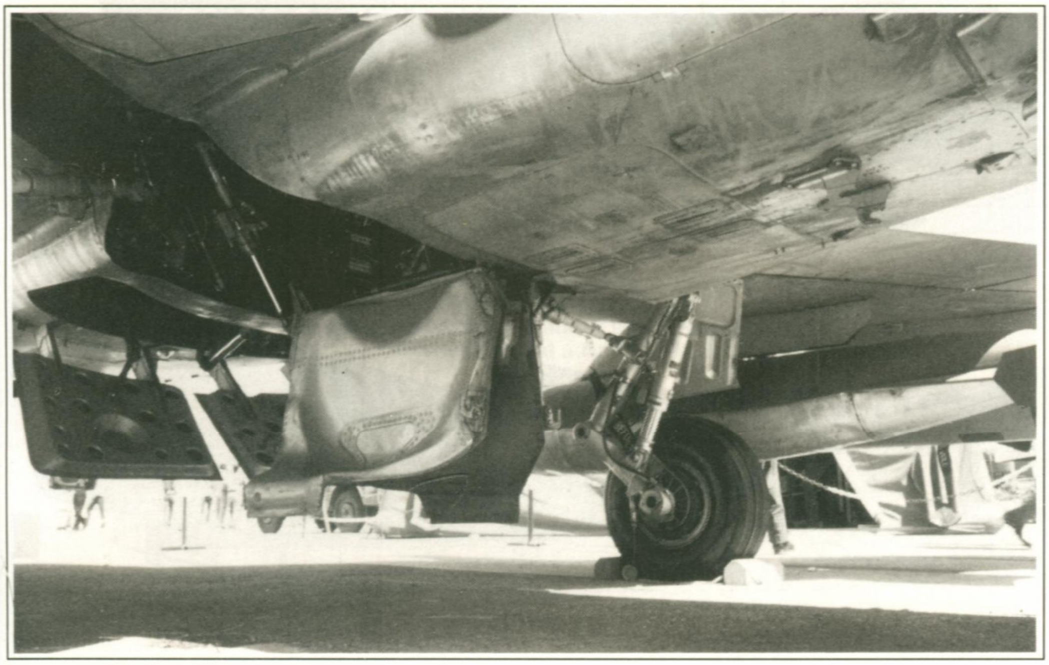








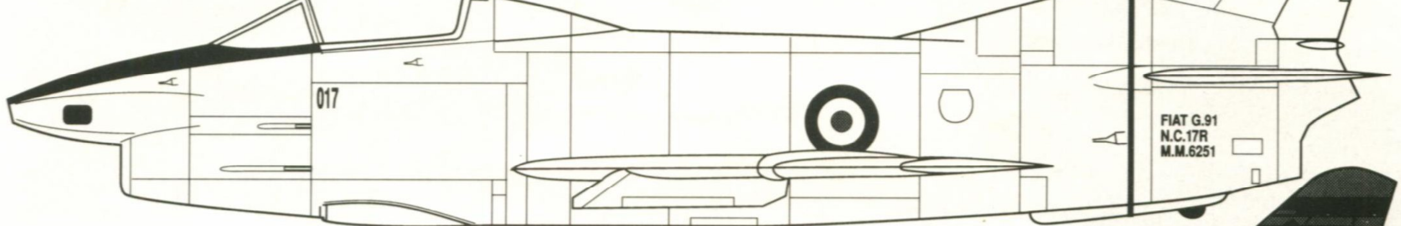




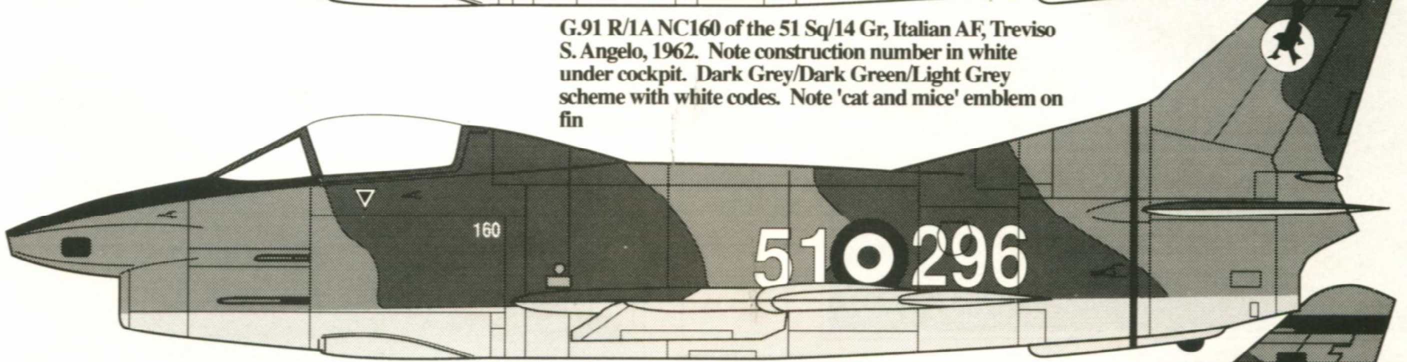
Top left: The G.91T's higher tail is evident in this view
Giuseppe Fassari
Top right: Underwing tank detail, G.91Y
Giuseppe Fassari
Left: cannon port detail of the G.91Y
Above: A comparison of a G.91R tail. Note the unusual badge on this *Waffenschule* 50 aircraft.
Charles Stafrace
Left: Undercarriage and underside detail, G.91Y
Giuseppe Fassari

G.91 (pre-series), CN.17R, MM6251, Italian AF. Experimental nose camera installation. Natural metal finish as seen at Caselle in 1960

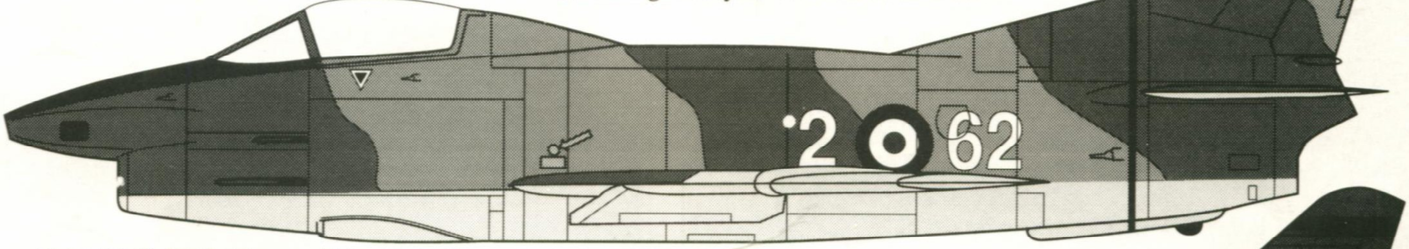
▨ IDENT GREEN
▨ IDENT RED
▨ DARK GREY
▨ LIGHT GREY
▨ DARK GREEN



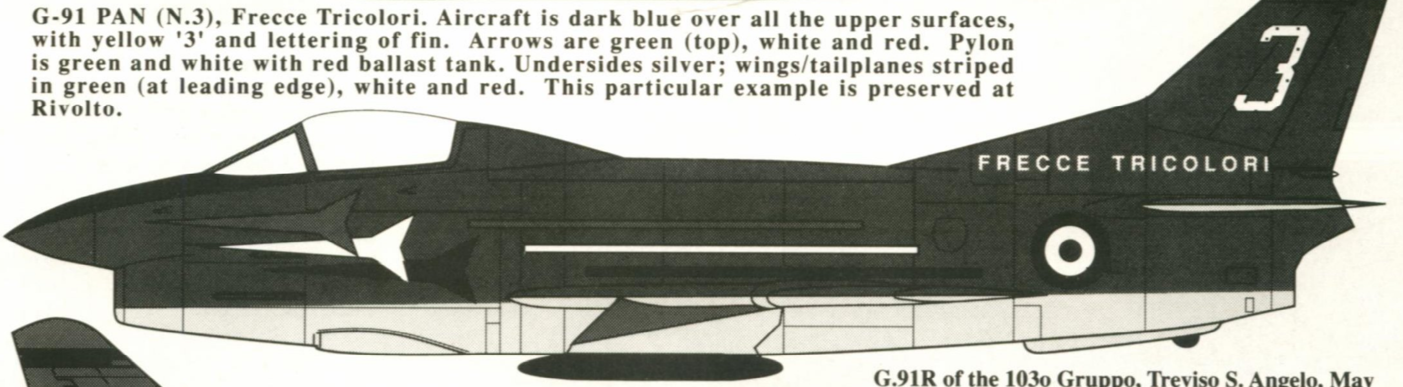
G.91 R/1A NC160 of the 51 Sq/14 Gr, Italian AF, Treviso S. Angelo, 1962. Note construction number in white under cockpit. Dark Grey/Dark Green/Light Grey scheme with white codes. Note 'cat and mice' emblem on fin



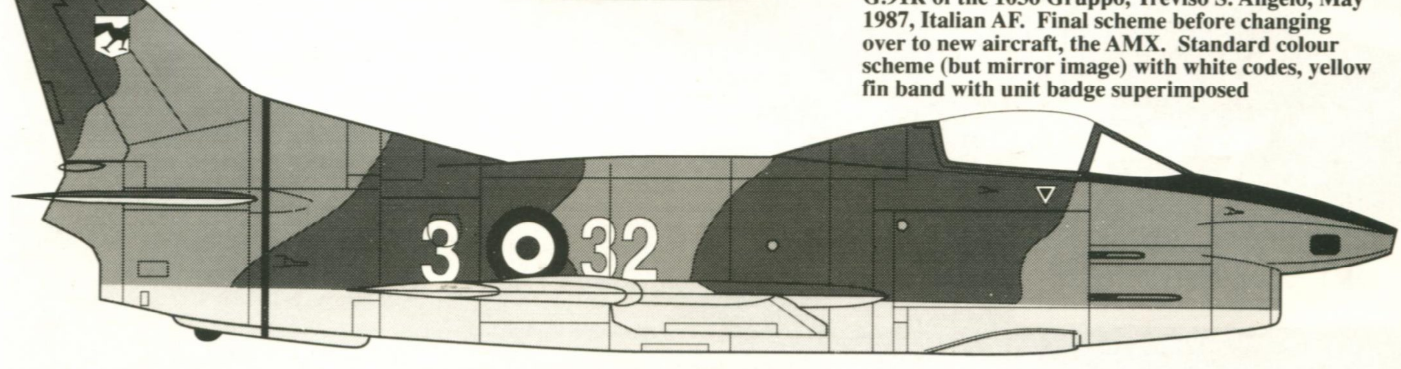
G.91 R/1B of the 32o Stormo, 13o Gr, Brindisi, Italian AF, 1965. Dark Grey/Dark Green/Light Grey scheme with white codes



G-91 PAN (N.3), Frecce Tricolori. Aircraft is dark blue over all the upper surfaces, with yellow '3' and lettering of fin. Arrows are green (top), white and red. Pylon is green and white with red ballast tank. Undersides silver; wings/tailplanes striped in green (at leading edge), white and red. This particular example is preserved at Rivolto.



G.91R of the 103o Gruppo, Treviso S. Angelo, May 1987, Italian AF. Final scheme before changing over to new aircraft, the AMX. Standard colour scheme (but mirror image) with white codes, yellow fin band with unit badge superimposed

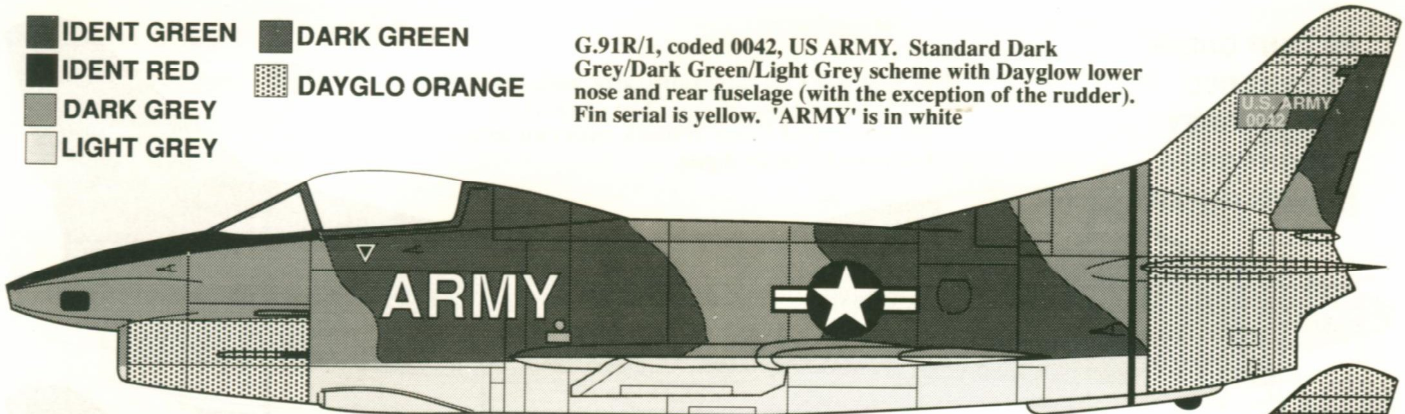


COLOUR SCHEMES – FIAT G.91

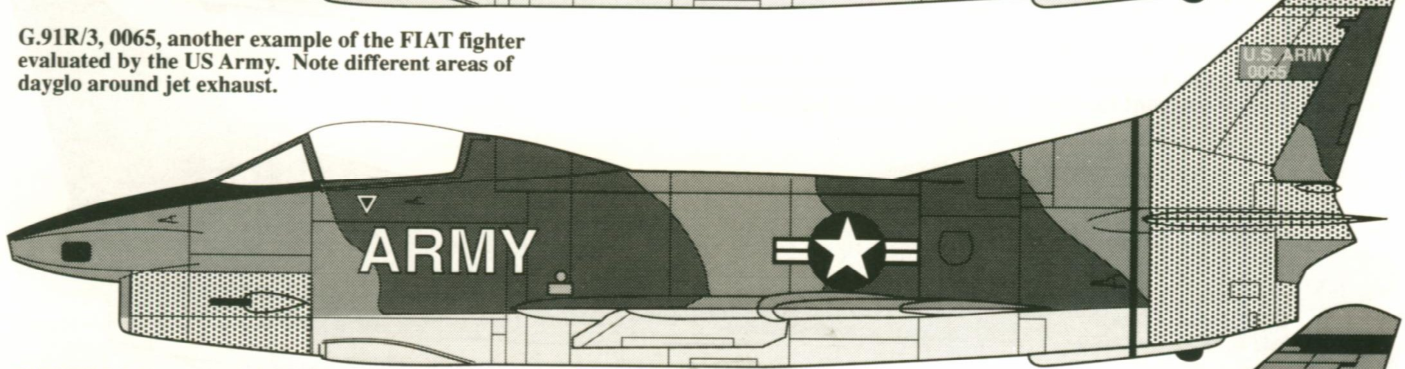
COMPUTER ART ©RICHARD J CARUANA

■ IDENT GREEN
■ IDENT RED
▨ DARK GREY
□ LIGHT GREY
■ DARK GREEN
▒ DAYGLO ORANGE

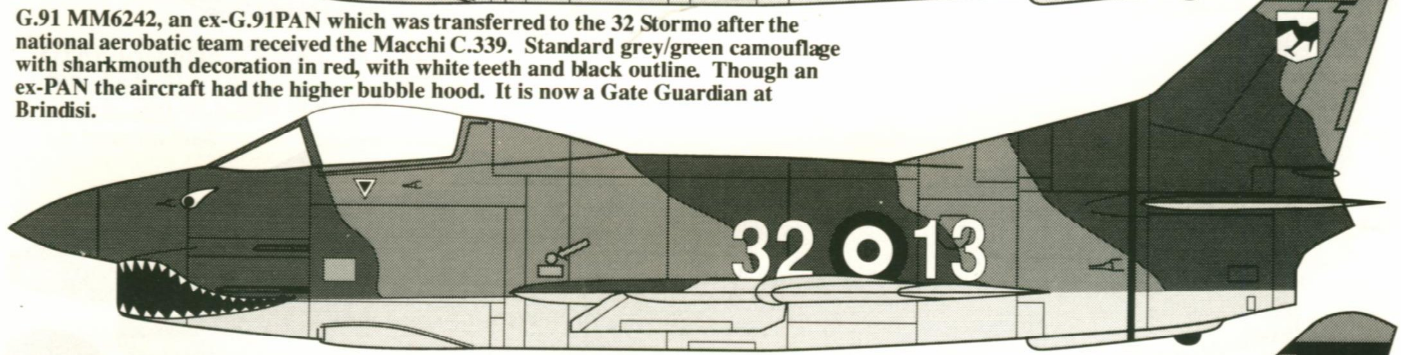
G.91R/1, coded 0042, US ARMY. Standard Dark Grey/Dark Green/Light Grey scheme with Dayglow lower nose and rear fuselage (with the exception of the rudder). Fin serial is yellow. 'ARMY' is in white



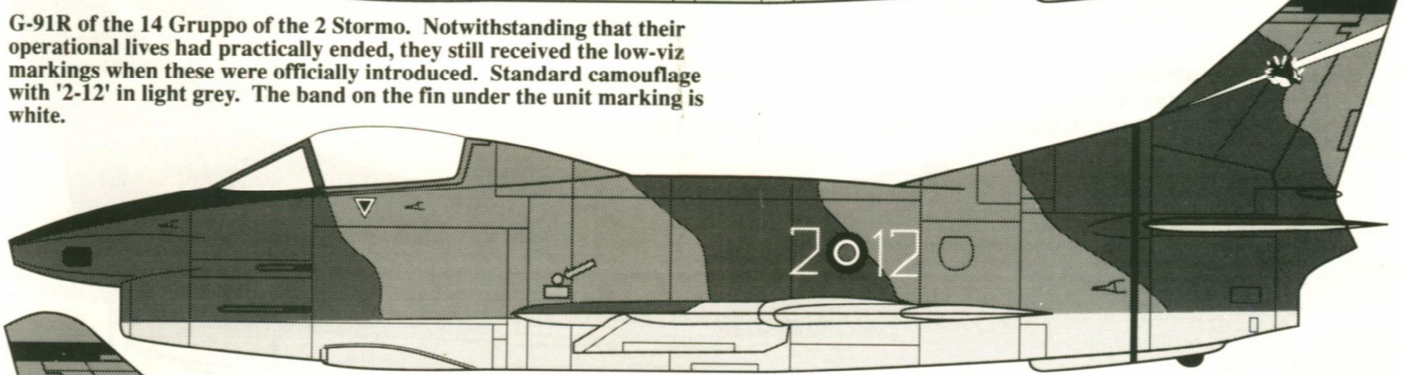
G.91R/3, 0065, another example of the FIAT fighter evaluated by the US Army. Note different areas of dayglo around jet exhaust.



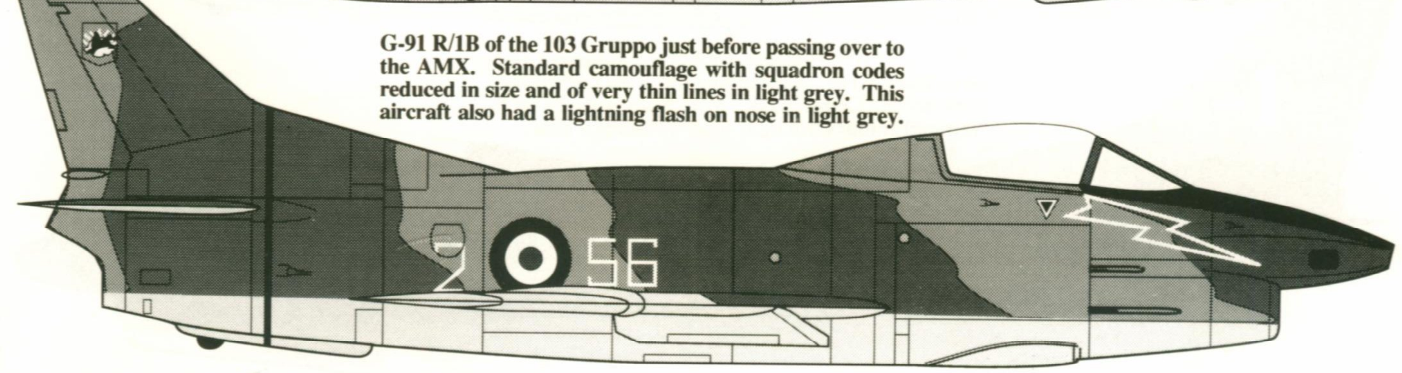
G.91 MM6242, an ex-G.91PAN which was transferred to the 32 Stormo after the national aerobatic team received the Macchi C.339. Standard grey/green camouflage with sharkmouth decoration in red, with white teeth and black outline. Though an ex-PAN the aircraft had the higher bubble hood. It is now a Gate Guardian at Brindisi.



G-91R of the 14 Gruppo of the 2 Stormo. Notwithstanding that their operational lives had practically ended, they still received the low-viz markings when these were officially introduced. Standard camouflage with '2-12' in light grey. The band on the fin under the unit marking is white.

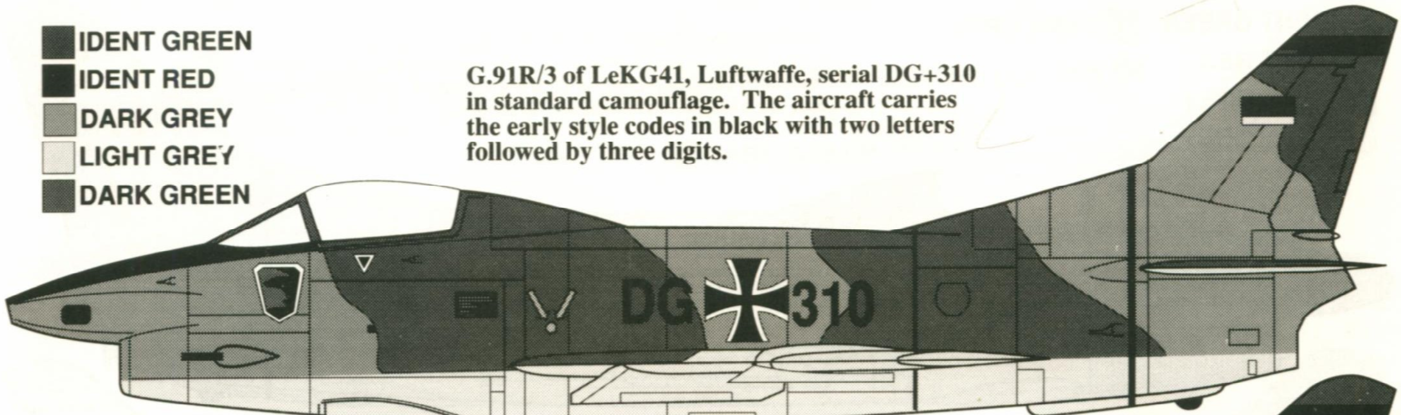


G-91 R/1B of the 103 Gruppo just before passing over to the AMX. Standard camouflage with squadron codes reduced in size and of very thin lines in light grey. This aircraft also had a lightning flash on nose in light grey.

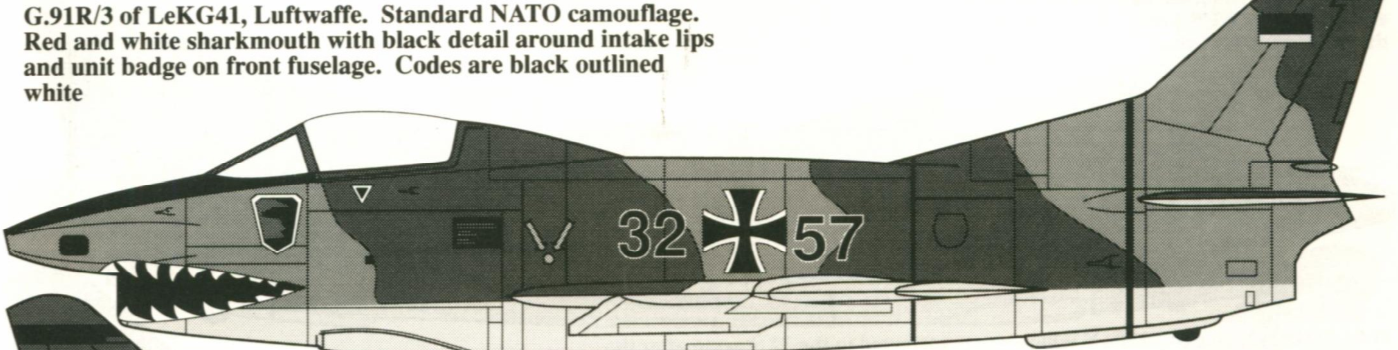


COMPUTER ART ©RICHARD J CARUANA

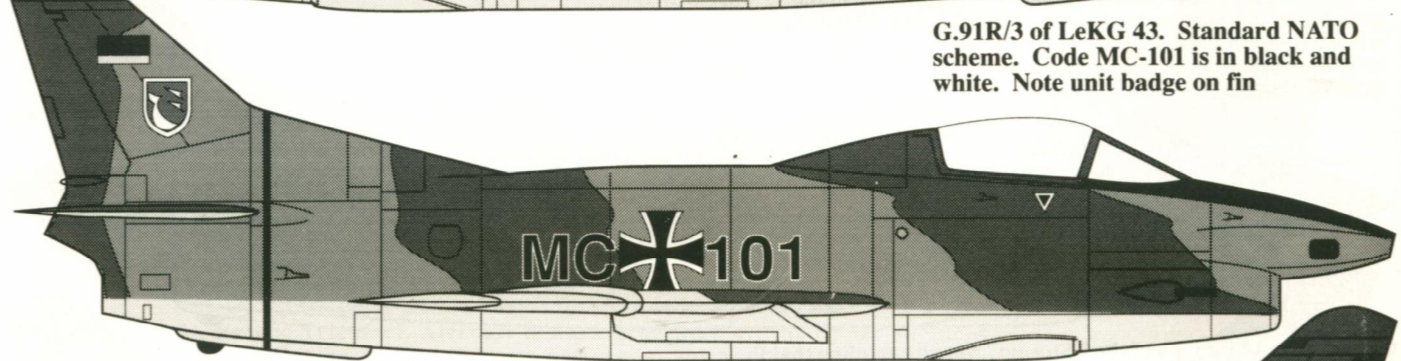
- ▨ IDENT GREEN
- ■ IDENT RED
- ▨ DARK GREY
- □ LIGHT GREY
- ▨ DARK GREEN



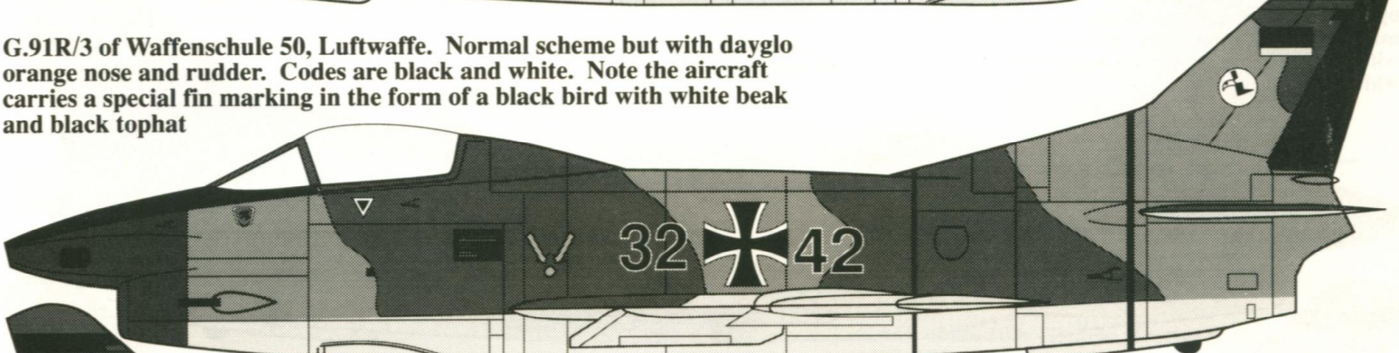
G.91R/3 of LeKG41, Luftwaffe, serial DG+310 in standard camouflage. The aircraft carries the early style codes in black with two letters followed by three digits.



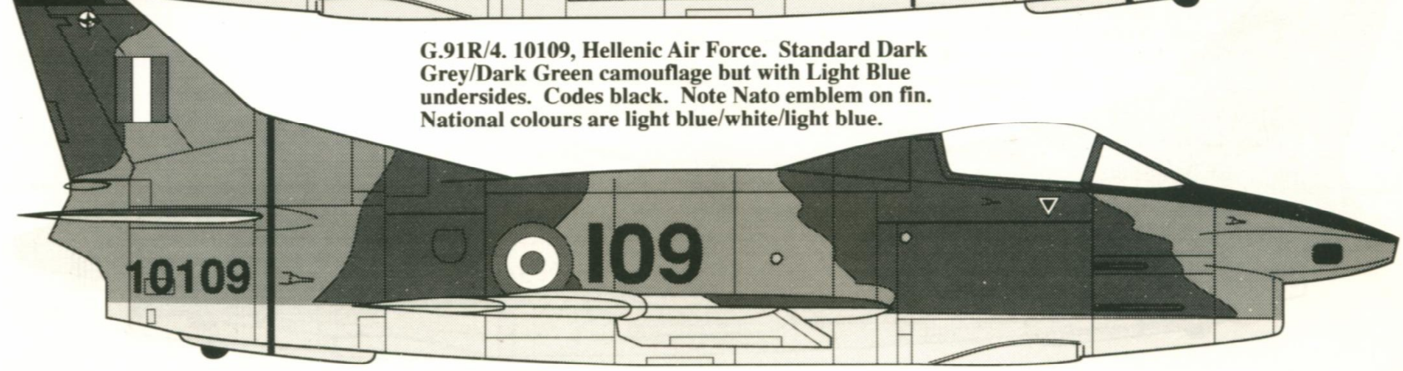
G.91R/3 of LeKG41, Luftwaffe. Standard NATO camouflage. Red and white sharkmouth with black detail around intake lips and unit badge on front fuselage. Codes are black outlined white



G.91R/3 of LeKG 43. Standard NATO scheme. Code MC-101 is in black and white. Note unit badge on fin



G.91R/3 of Waffenschule 50, Luftwaffe. Normal scheme but with dayglo orange nose and rudder. Codes are black and white. Note the aircraft carries a special fin marking in the form of a black bird with white beak and black tophat

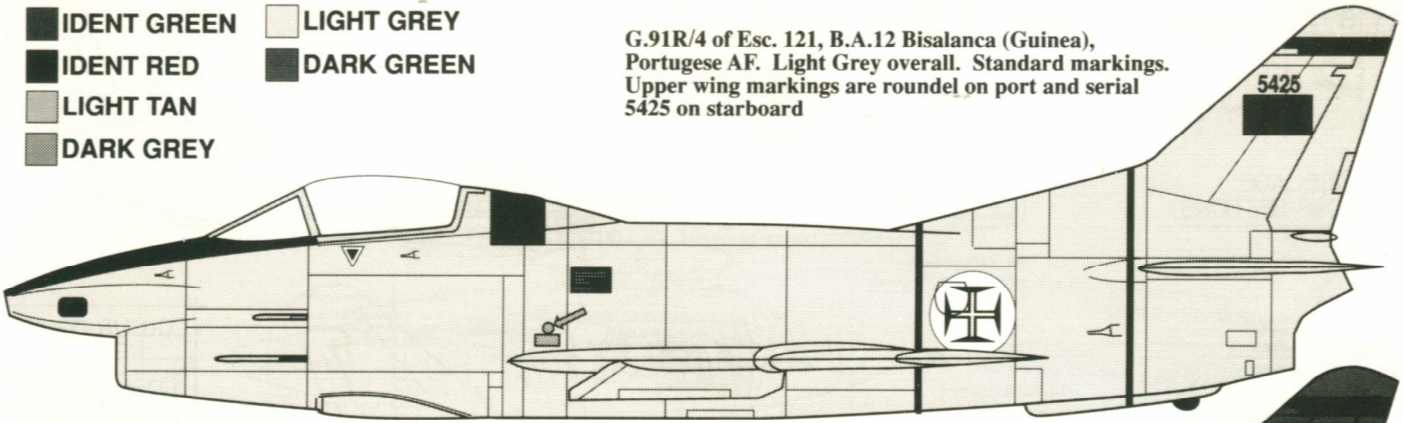


G.91R/4. 10109, Hellenic Air Force. Standard Dark Grey/Dark Green camouflage but with Light Blue undersides. Codes black. Note Nato emblem on fin. National colours are light blue/white/light blue.

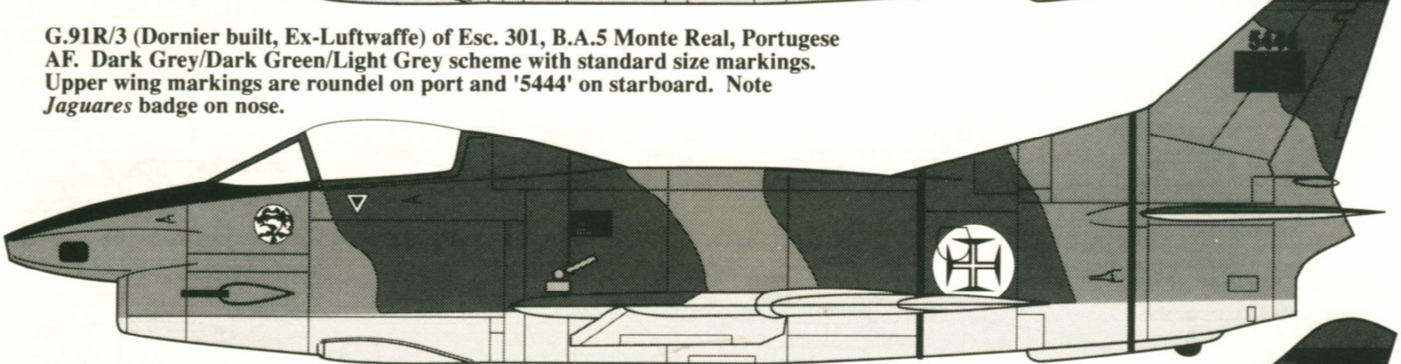
COMPUTER ART ©RICHARD J CARUANA

■ IDENT GREEN
■ IDENT RED
▨ LIGHT TAN
▨ DARK GREY
☐ LIGHT GREY
■ DARK GREEN

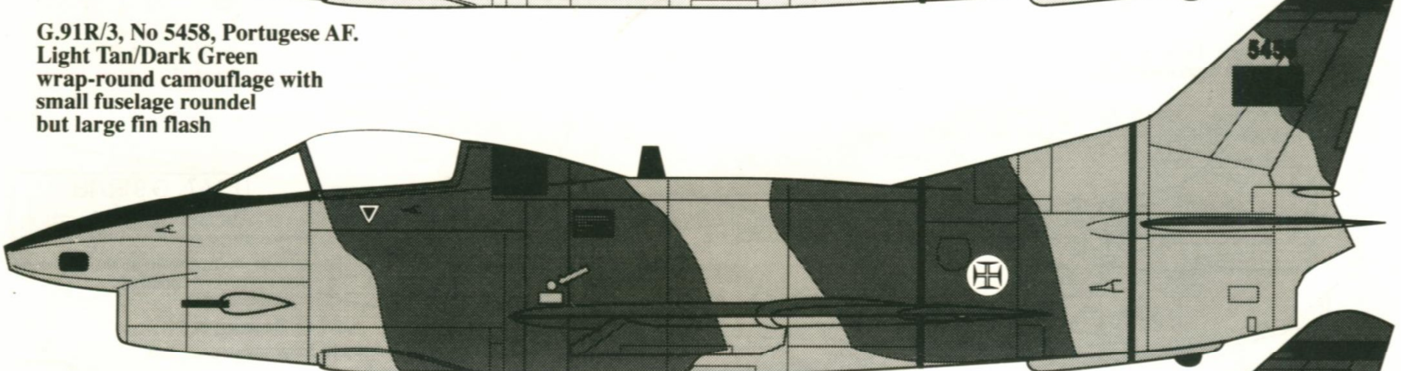
G.91R/4 of Esc. 121, B.A.12 Bisalanca (Guinea), Portugese AF. Light Grey overall. Standard markings. Upper wing markings are roundel on port and serial 5425 on starboard



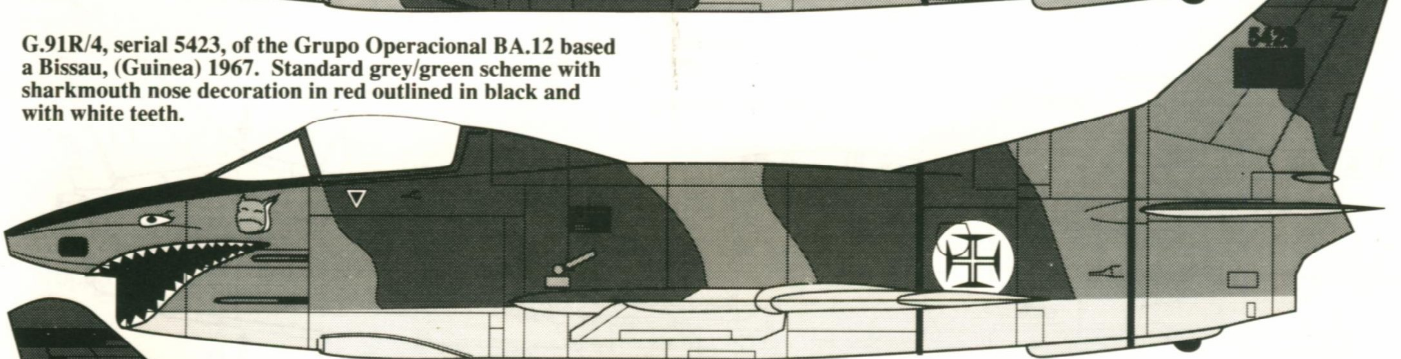
G.91R/3 (Dornier built, Ex-Luftwaffe) of Esc. 301, B.A.5 Monte Real, Portugese AF. Dark Grey/Dark Green/Light Grey scheme with standard size markings. Upper wing markings are roundel on port and '5444' on starboard. Note *Jaguares* badge on nose.

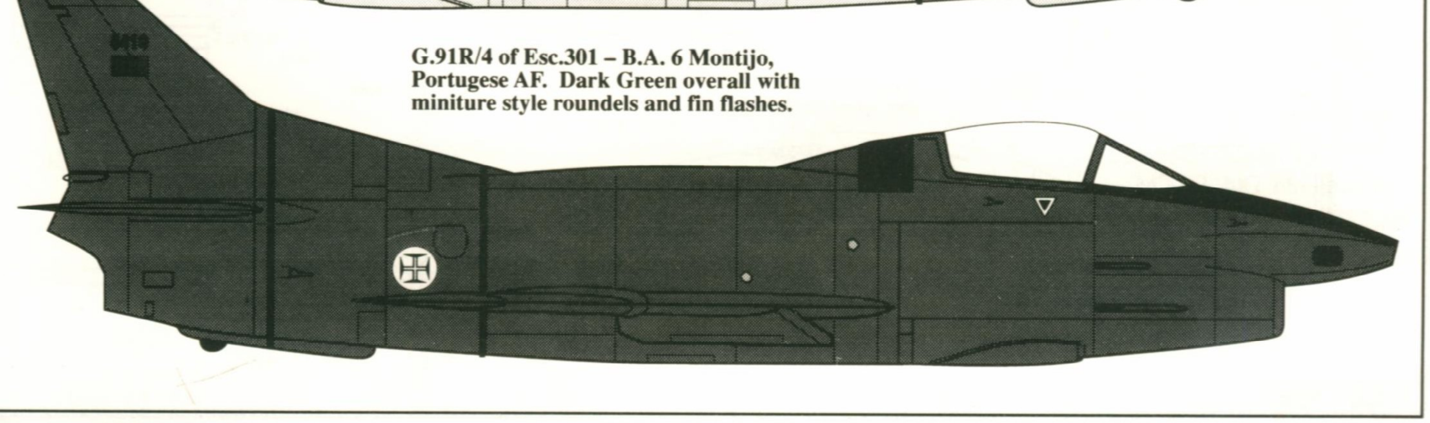


G.91R/3, No 5458, Portugese AF.
Light Tan/Dark Green
wrap-round camouflage with
small fuselage roundel
but large fin flash

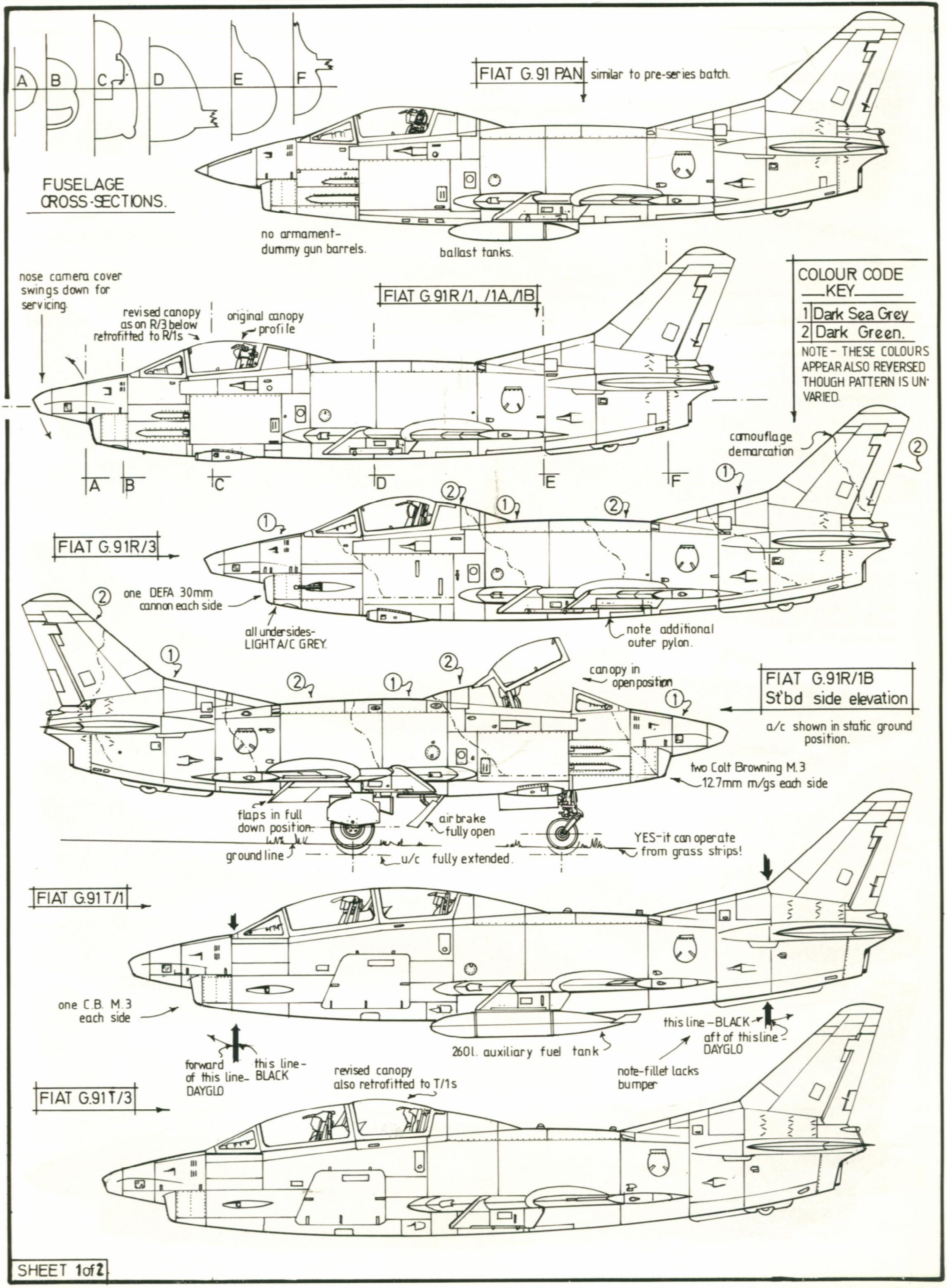


G.91R/4, serial 5423, of the Grupo Operacional BA.12 based a Bissau, (Guinea) 1967. Standard grey/green scheme with sharkmouth nose decoration in red outlined in black and with white teeth.





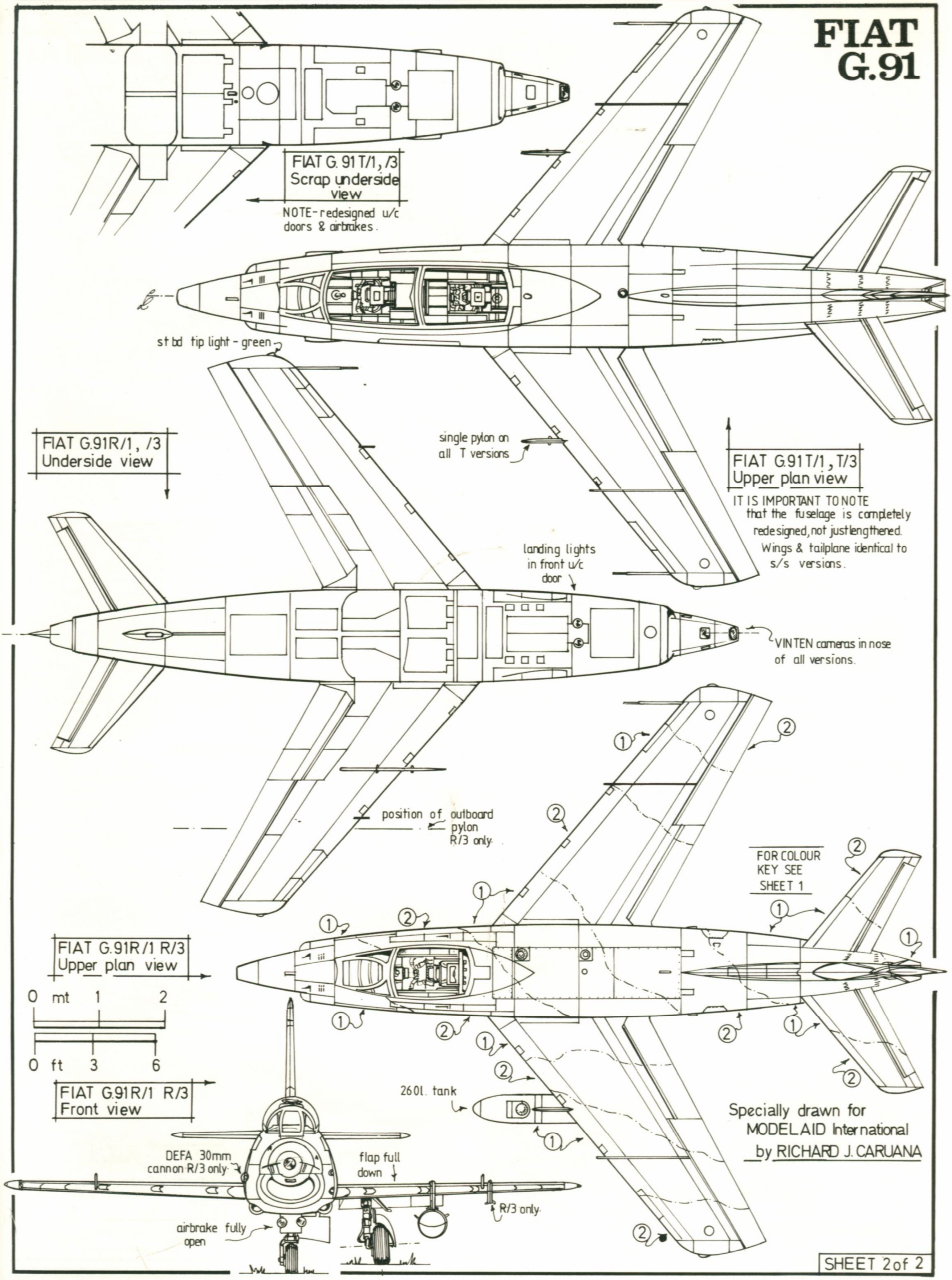
G.91R/4 of Esc.301 – B.A. 6 Montijo, Portugese AF. Dark Green overall with miniture style roundels and fin flashes.


A
B
C
D
E
F
FUSELAGE CROSS-SECTIONS.
FIAT G.91 PAN similar to pre-series batch.
no armament- dummy gun barrels.
ballast tanks.
nose camera cover swings down for servicing.
revised canopy as on R/3 below retrofitted to R/1s
original canopy profile
FIAT G.91R/1, /1A, /1B
COLOUR CODE KEY
1 Dark Sea Grey
2 Dark Green.
NOTE – THESE COLOURS APPEAR ALSO REVERSED THOUGH PATTERN IS UNVARIED.
camouflage demarcation
FIAT G.91R/3
one DEFA 30mm cannon each side
all undersides- LIGHT A/C GREY.
note additional outer pylon.
canopy in open position
FIAT G.91R/1B St'bd side elevation
a/c shown in static ground position.
two Colt Browning M.3 12.7mm m/gs each side
flaps in full down position
air brake fully open
ground line
u/c fully extended.
YES-it can operate from grass strips!
FIAT G.91T/1
one C.B. M.3 each side
this line – BLACK
aft of this line – DAYGLO
260l. auxiliary fuel tank
forward of this line – DAYGLO
this line – BLACK
revised canopy also retrofitted to T/1s
note-fillet lacks bumper
FIAT G.91T/3
SHEET 1of2

SCALE PLANS – FIAT G.91R/T – 1:72 SCALE

BY RICHARD J CARUANA

FIAT G.91

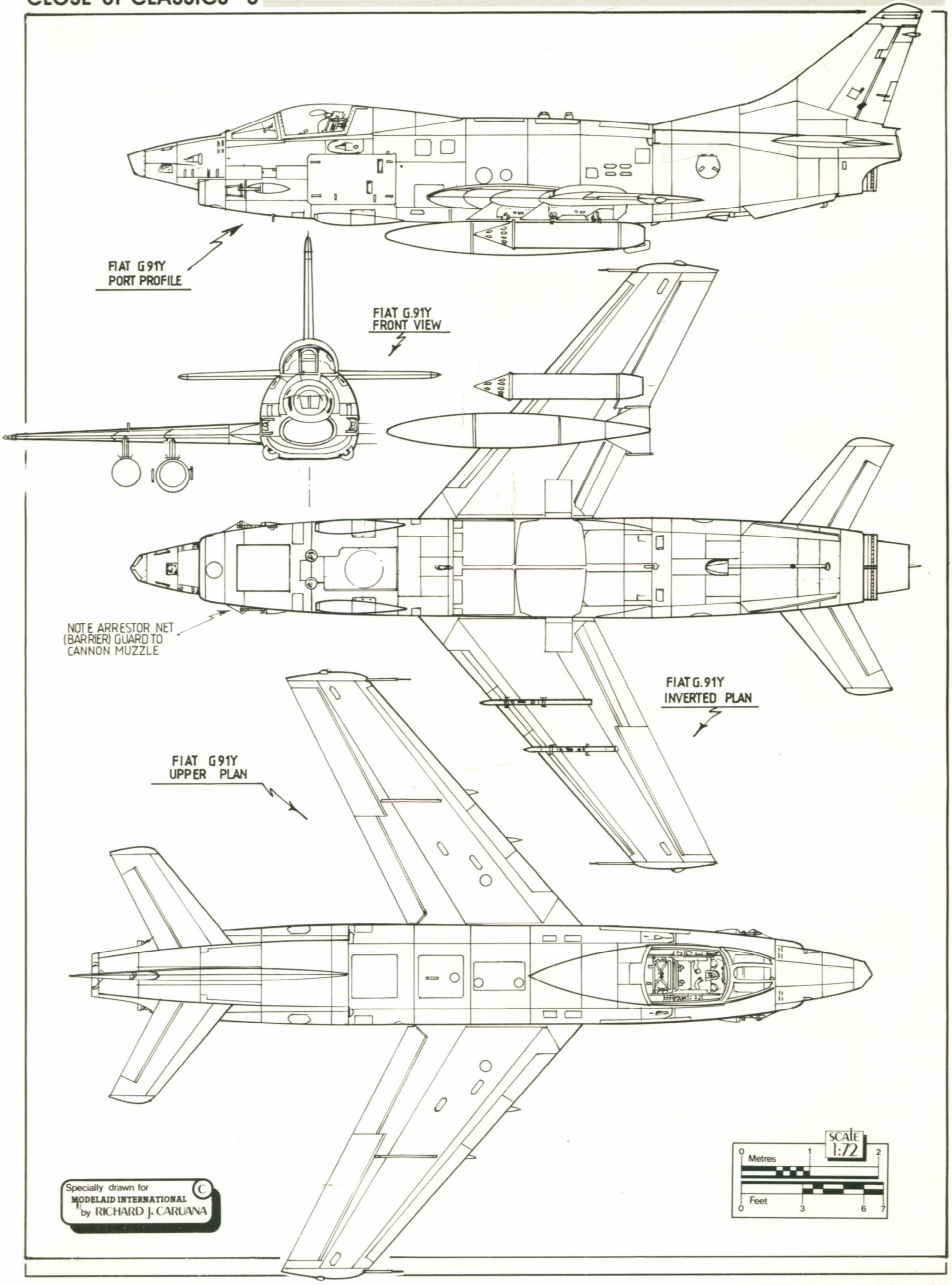


NOTE - redesigned u/c doors & airbrakes.

IT IS IMPORTANT TO NOTE that the fuselage is completely redesigned, not just lengthened. Wings & tailplane identical to s/s versions.

Specially drawn for MODELAID International by RICHARD J. CARUANA

SHEET 2 of 2



Specially drawn for MODELAID INTERNATIONAL by RICHARD J. CARUANA ©

SCALE PLANS – FIAT G.91 Y – 1:72 SCALE

BY RICHARD J CARUANA

APPENDIX 1 – SPECIFICATIONS

FIAT G.91R/1

Dimensions:		
Span	28' 1"	8.56m
Length	33' 9.25"	10.30m
Height	13' 1.25"	4m
Wing Area	176.7sq ft	16.4m²
Power Plant:		
Type: 1 x Orpheus 801-02		
Thrust	4850lb	2200kg
Weight/Thrust ratio	1:5.8	
Performance:		
Max Speed: sea level	668mph	1068km/h
at 5000 ft (1520m)	675mph	1080km/h
Initial climb rate	6003ft/m	183m/min
Ceiling	42,980ft	13,100m
Radius	200mls	320km
Ferry range	1150mls	1840km
Take-off Distance *(to clear 50ft/15m)*	3870ft	1180m
Armament:		
Fixed: 4 x 12.7mm machine guns		
Stores load	1000lb	454kg
Weights:		
Empty	6835lb	3100kg
Max. take-off	12470lb	5670kg
Fuel Capacity:		
Internal	462gls	2100lt

FIAT G.91R/3

Dimensions:		
Span	28' 1"	8.56m
Length	33' 9.25"	10.30m
Height	13' 1.25"	4m
Wing Area	176.7sq ft	16.4m²
Power Plant:		
Type: 1 x Orpheus 803-02		
Thrust	5000lb	2268kg
Weight/Thrust ratio	1:6	
Performance:		
Max Speed: sea level	668mph	1068km/h
at 5000 ft (1520m)	675mph	1080km/h
Initial climb rate	6003ft/m	183m/min
Ceiling	42,980ft	13,100m
Radius	200mls	320km
Ferry range	1150mls	1840km
Take-off Distance *(to clear 50ft/15m)*	3870ft	1180m
Armament:		
Fixed: 4 x 12.7mm machine guns		
Stores load	1000lb	454kg
Weights:		
Empty	7390lb	3360kg
Max. take-off	12470lb	5670kg
Fuel Capacity:		
Internal	462gls	2100lt

FIAT G.91R/4

Dimensions:		
Span	28' 1"	8.56m
Length	33' 9.25"	10.30m
Height	13' 1.25"	4m
Wing Area	176.7sq ft	16.4m²
Power Plant:		
Type: 1 x Orpheus 803-02		
Thrust	5000lb	2268kg
Weight/Thrust ratio	1:6	
Performance:		
Max Speed: sea level	668mph	1068km/h
at 5000 ft (1520m)	675mph	1080km/h
Initial climb rate	6003ft/m	183m/min
Ceiling	42,980ft	13,100m
Radius	200mls	320km
Ferry range	1150mls	1840km
Take-off Distance *(to clear 50ft/15m)*	3870ft	1180m
Armament:		
Fixed: 2 x 30mm cannon		
Stores load	1000lb	454kg
Weights:		
Empty	7390lb	3360kg
Max. take-off	12470lb	5670kg
Fuel Capacity:		
Internal	462gls	2100lt

FIAT G.91T/1 and T/3

Dimensions:		
Span	28' 3"	8.60m
Length	38' 3.75"	11.67m
Height	13' 11.25"	4.26m
Wing Area	176.7sq ft	16.4m²
Power Plant:		
Type: 1 x Orpheus 801-02		
Thrust	4850lb	2200kg
Weight/Thrust ratio	1:5.8	
Performance:		
Max Speed: sea level	631mph	1010km/h
at 5000 ft (1520m)	668mph	1070km/h
Initial climb rate	6003ft/m	183m/min
Ceiling	39,000ft	11,890m
Radius	200mls	320km
Ferry range	1367mls	2180km
Take-off Distance *(to clear 50ft/15m)*	4100ft	1250m
Armament:		
Fixed: 2 x 12.7mm machine guns		
Stores load	1000lb	454kg
Weights:		
Empty	7240lb	3290kg
Max. take-off	13340lb	6050kg
Fuel Capacity:		
Internal	350gls	1600lt

FIAT G.91Y

Dimensions:		
Span	29' 6.3"	9m
Length	38' 7.6"	11.78m
Height	14' 6.3"	4.43m
Wing Area	195.14sq ft	18.1m²
Power Plant:		
Type: 2 x J85-GE-13A		
Thrust (each)	2725lb	1230kg
Performance:		
Max Speed: sea level	690mph	1110km/h
Initial climb rate	17000ft/m	5181m/min
Ceiling	41,000ft	12,500m
Radius	372mls	600km
Ferry range	2110mls	3376km
Take-off Distance *(to clear 50ft/15m)*	2460ft	750m
Armament:		
Fixed	2 x 30mm cannon	
Stores load	4000lb	1814kg
Weights:		
Empty	8598lb	3900kg
Max. take-off	19180lb	7800kg
Fuel Capacity:		
Internal	740gls	3200lt

APPENDIX 2– VERSIONS OF THE G.91

G.91	Prototypes and pre-production aircraft.
G.91A	One experimental model (NC.31) built to test slats and wing fuel tanks for longer range.
G.91BS/1	(BS–Battle Surveillance). Project derived from the G.91T with enhanced electronic and photographic equipment. Not built
G.91BS/2	Two-seat version of the G.91BS/1, also remained a project.
G.91E	Proposed version of the G.91Y for the AMI. Not built.
G.91N	One example built form pre-production model with extra navigation equipment such as Decca and Rho-Theta.
G.91PAN	Aerobatic version for *Frecce Tricolori* with non-photographic nose, derived mostly from pre-production models but also from R/1. The small tanks under the wing pylons are in fact balast to improve cg.
G.91R	Conversion of 4 pre-production models to photographic version.
G.91R/1	Production model for AMI, with three Vinten cameras in nose and 4 x 12.7mm machine guns.
G.91R/1A	Simiarl to R/1 but with R.3 standard instrumentation.
G.91R/1B	Similar to R/1A but with strengthened structure, more powerful brakes, tubeless tyres and some variation in instrumentation.
G.91R/2	Ordered by France but never built.
G.91R/3	Standard single-seat model ordered by the *Luftwaffe*. Similar to R/1 but with more sophisticated instrumentation, 2 x 30mm cannon and four wing pylons instead of two.
G.91R/3SATS	One *Luftwaffe* conversion of R/3 with JATO rockets and arrestor hook.
G.91R/4	Model ordered by Greece and Turkey but never taken up, eventually purchased by *Luftwaffe*. Similar to R/3 but with 4 x 12.7mm machine guns in lieu of cannon.
G.91R/5	Version studied for Norway, practically an R/1 with range increased to 940 miles (1500km). Not built.
G.91R/6	Strengthened version never built but some characteristics of which were incorporated into the R/1B.
G.91RS	Project derived from G.91A with different wing and Orpheus B.Or 12 of 7050lb/st (3200kg.s). Not built.
G.91T	Two prototypes of two-seat version derived from G.91R/1.
G.91T/1	Production two-seat version with two 12.7mm machine guns.
G.91T/2	Proposed two-seat version for French AF. Not built.
G.91T/3	Two-seat version for *Luftwaffe* with R/3 instrumentation.
G.91T/3 Logair	*Luftwaffe* conversion of T/3 with data acquisition probe.
G.91T/4	Projected version for AMI with NASARR and F-104 instrumentation.
G.91TS	Projected supersonic version of G.91T. Not built
G.91Y	Practically a different aircraft derived from G.91T with twin jets. Built for AMI.
G.91YT	Projected two-seater version of G.91Y. Not built.
G.91YS	Projected version of G.91Y for Switzerland. One built.

APPENDIX 5 – Numbers Produced & Users

BY FIAT:	
R/1, Prototypes & Pre series:	129
R/3	50
R.4	50
T/1 + Prototypes	101
T.3	44
Total	**373**

USERS:	
AMI	229
Luftwaffe	460
FAP	136 (ex-Luftwaffe)
Angolan AF	4? (ex-FAP)
FIAT	1

BY FLUGZEUG-UNION SUD:	
R/3	294
T/3	22
Total	**316**

Total Production 690

APENDIX 3– Fôrça Aérea Portuguesa G.91s

Serial	c/n	ex-Luftwaffe serial
5401	109	BD+235
5403	114	BD+240
5403	115	BD+241
5404	117	BD+243
5405	118	BD+244
5406	126	BD+252
5407	132	BD+264
5408	153	BD+385
5409	90	BD+231
5410	131	BD+263
5411	144	BD+276
5412	149	BD+372
5413	138	BD+270
5414	133	BD+265
5415	147	BD+379
5416	148	BD+380
5417	110	BD+236
5418	121	BD+247
5419	129	BD+261
5420	130	BD+262
5421	135	BD+267
5422	139	BD+271
5423	146	BD+378
5424	152	BD+384
5425	100	BD+233
5426	101	BD+234
5427	111	BD+237
5428	112	BD+238
5429	116	BD+242
5430	134	BD+266
5431	136	BD+268
5432	145	BD+377
5433	119	BD+245
5434	120	BD+246
5435	127	BD+253
5436	128	BD+254
5437	141	BD+273
5438	143	BD+275
5439	151	BD+383
5440	142	BD+274

APPENDIX 4 – FIAT G.91 Production

	Qty	c/n	Serial	User
G.91 Prototype	1	NC.1	–	FIAT
G.91 Prototype	3	NC.1b, 2, 3	MM.565-567	AMI
Pre-Series	27	NC.4-30	MM.6238-6264	AMI[1]
G.91R/1	23	NC.31-53	MM.6238-6287	AMI[2]
G.91R/3	50	NC.54-89	30+01 to 30+43 91-97, 102-108	Luftwaffe[3]
G.91R/4	50	NC.90, 98-101	5401-5440 109-153	Luftwaffe/FAP/Angola[4]
G.91R/1A	25	NC.154-178	MM.6290-6314	AMI[5]
G.91R/1B	50	NC.179-228	MM.6375-6424	AMI
G.91R/3	294	NC.301-594	30+44 to 30+99 31+01 to 31+99 32+01 to 32+99 33+01 to 33+23	Luftwaffe[6]
G.91T Prototypes	2	NC.1, 2	MM.6288-6289	AMI
G.91T/3	44	NC1-44	34+01 to 34+41	Luftwaffe[7]
G.91T/1 Srs.1	65	NC.45-119	MM.6315-6374 MM.6425-6438	AMI
G.91T/1 Srs.2	34	NC.120-153	MM.54392-54426	AMI
G.91T/3	22	NC.601-622	34+41 to 34+62	Luftwaffe/FAP[8]

Notes:

1. MM.6251, 53, 57 and 59 built as G.91R. 2o converted to G.91PAN serialled 6238-44, 6248-56, 6259-61 and 6264.
2. MM.6265 eventually converted to G.91PAN.
3. 96 R/3s and T/3s transferred to FAP between 1974 and 1982. German serials includes only those airframes existing at time of change-over by Luftwaffe to new serial system on January 1, 1968.
4. NC.98 and 109 flew first with Greek markings, serialled 10098 and 10109. All R/4s subsequently transferred by Luftwaffe to FAP in 1966 except for NC.98, 99, 113, 122-125, 137, 140 and 150.

5 .MM.6310, 6311 and 6314 converted to PAN.

6. Produced by Fluzeug-Union Sud. 96 R/3s and T/3s transferred to FAP between 1974 and 1982.
7. Produced by FIAT for Luftwaffe. Part of 96 T/3s and R/3s transferred to FAP between 1974 and 1982.
8. Produced by Flugzeug-Union Sud. Part of 96 T/3s and R/3s transferred to FAP between 1974 and 1982.

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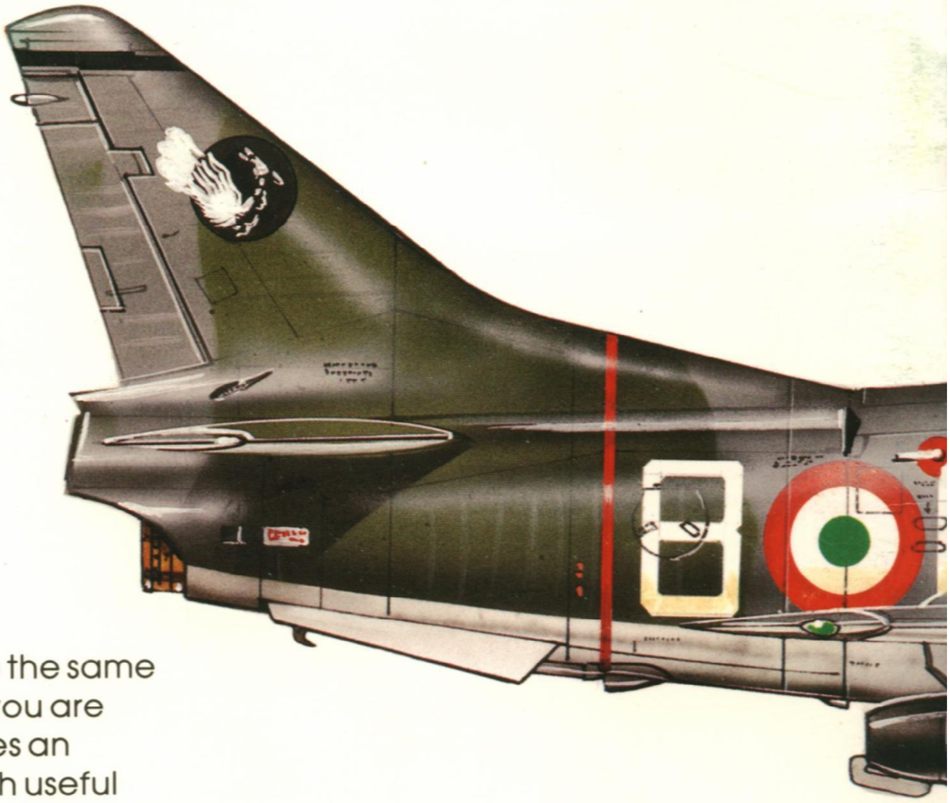

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